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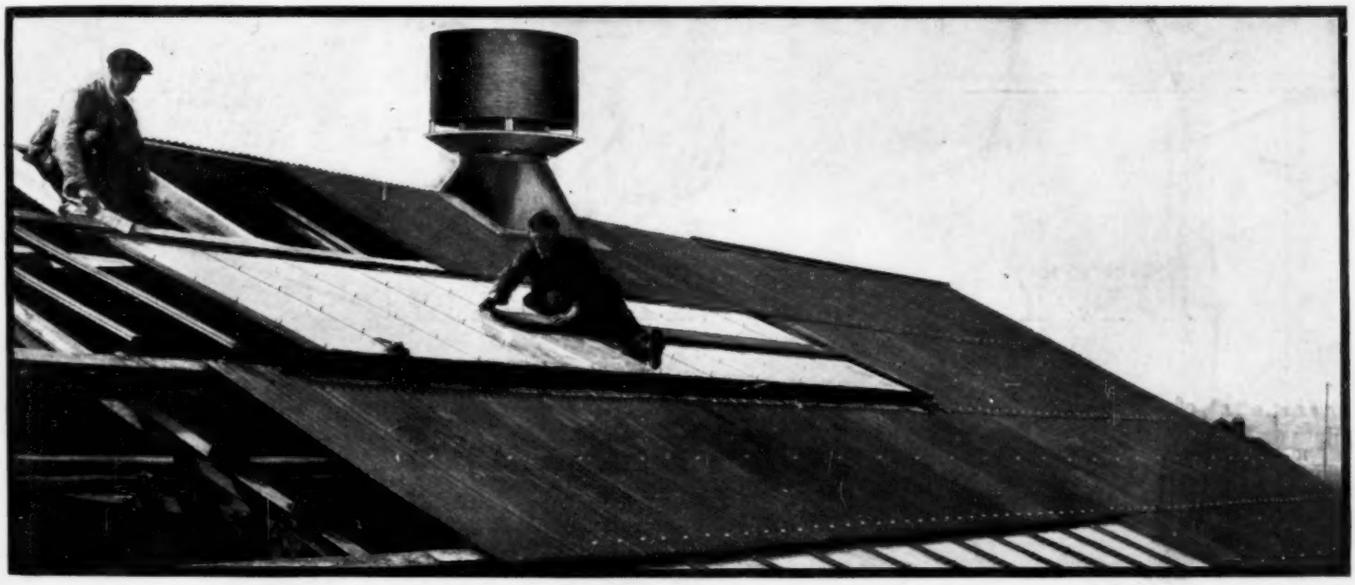

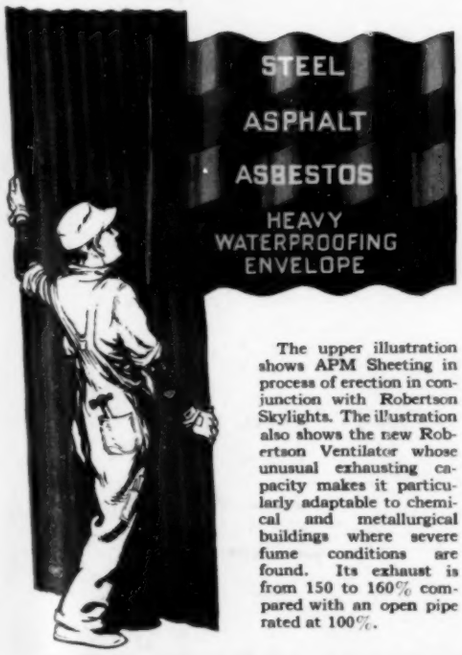

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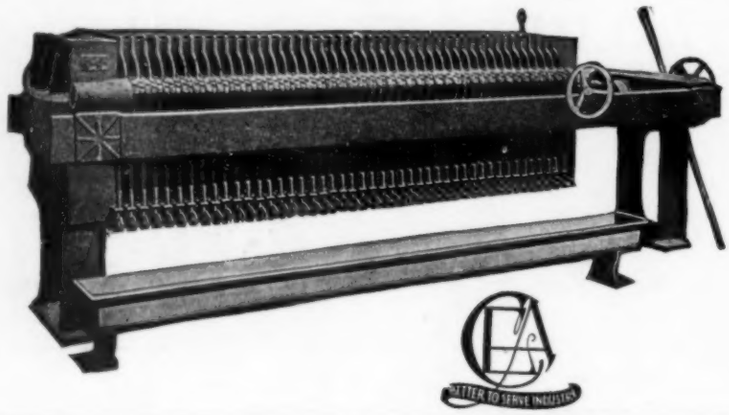

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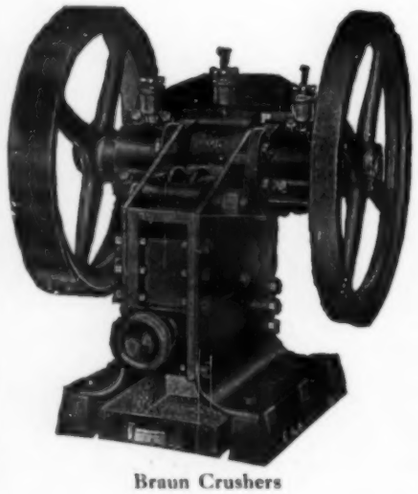

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CHEMICAL & METALLURGICAL ENGINEERING

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H. C. PARMELEE, Editor

Volume 29 — New York, July 16, 1923 — *Number* 3

The "Met." In "Chem. & Met."

AN OLD FRIEND of ours called us on the telephone the other day to inquire with some asperity what we meant by dropping the metallurgy from the paper. Somewhat astonished, we inquired what he meant by such a ridiculous question. We pointed to recent articles that had been published and to the metallurgical conventions reported. We told him of the many metallurgical articles in prospect and begged him to believe that we had no such thought.

Does it seem likely that a man would build a factory and then at a peak of production set fire to it? That is entirely analogous to the elimination of metallurgy from *Chem. & Met.* We have built up a prestige in the metallurgical field of which we are justly proud. Should we then destroy that prestige with wanton shears?

Actually the exact reverse is true. We intend to expand our metallurgical service and to cover that shadowy borderland between the metallurgist and the chemical engineer, between the maker and the user of metals. Applying the principles of physical metallurgy, the metallurgical engineer has produced a magnificent series of useful alloys. Hundreds of them are new and have not yet received the severe tests of industrial usage. To obtain information of this kind, to correlate it and present it so that the progress to "Better Metals" shall be orderly and swift, is one of the new tasks which we have set ourselves.

Yet again metallurgical practice has changed and developed. It has had to be so, for the production of new alloys has been tremendous and new technology was imperative. To discover these developments and to have them chronicled will create a new literature of metallurgical operation. It is another task that *Chem. & Met.* has set for itself in metallurgy.

To record the important advances in physical metallurgy is already a part of our program. This has been a factor in building our metallurgical prestige. The intimate contact with the progressive scientific and technological organizations that have done so much to create modern metallurgy is of greatest value and we shall aim to focus the advances reported at the meetings and conventions of these bodies as we have in the past. Be assured that "Met." is still a part of *Chem. & Met.*—a more integral part than ever before. Be assured that our prestige will inspire us to build a greater literature, a more complete service, and a broader usefulness in metallurgy than ever before.

Limitations of American Enameled Equipment

IN A PAPER on Materials of Chemical Equipment presented at the Wilmington meeting of the American Institute of Chemical Engineers, H. F. Whittaker remarked that enameled equipment was a kind of unwelcome stranger that we must recognize when necessary, that its shortcomings outweigh its advantages and that it was a last resort material only.

We had it on our mind to protest against this severe arraignment by indicating a wide sphere of usefulness for this type of equipment, notably in the organic chemical field. However, a potential champion of the enamel equipment manufacturers arose and, claiming to speak for the industry, began by admitting all of the damning indictments. Enamel manufacturers recognize the limitations of their equipment and realize that it is a last resort in the chemical field. The speaker continued by enumerating the difficulties of manufacture—the danger to the enamel from railroad or any other transportation, etc. It was on the whole a tale of woe—an admission of defeat. If it was not so intended, it at least conveyed that impression to the listeners.

There are problems in this world of joy and light in connection with which it might be wise and prudent to hang out the defeatist sign. For example, nobody considers seriously the possibility of swimming across the ocean nor of walking across the continent without stopping. Admittedly these things can't be done. But with enamel equipment it is different. For at least 20 years and doubtless longer enameled equipment of a very high order has been made in France and Germany. A distinguished chemical engineer related to us this story illustrating the caliber and quality of this material. A container was needed for oleum. Enamel was suggested and a trial piece installed (American made). We can't remember whether it lasted 3 minutes or 3 hours, but not long enough to have a cost card made out for it. Negotiations were then undertaken with a French concern. Yes, they knew exactly what was wanted. It was standard with them. The piece arrived and was installed; that was in 1905 and it is still in use. Note too that it traveled 3,500 miles by rail and boat. Of course the other units were replaced with this enamel too.

This tale has many brothers and sisters. American enameled equipment, much improved since 1914, is useful today in certain fields. But the spirit of the manufacturers as reflected in Wilmington seemed to be that they had reached some sort of a summit and that fur-

ther aspirations were unattainable. Actually they should be just beginning to climb toward a goal which was set up more than 20 years ago. The inevitable conclusion must be reached that this attitude is plain soldiering on a job. How can they hope that the chemical engineering industries will rally to their support if they do not play fair with the industries?

A Charitable Enterprise— Public Speaking for Public Speakers

THE merry round of conventions is over until September. They are enjoyable, profitable, stimulating. They could be more so. As past masters in listening to convention programs we make this suggestion to secretaries, program committees, chairmen et al.:

Don't let a man read his paper!

If a speaker begins "Fellow members and guests," and then proceeds to take a large manuscript from his pocket, walk up to him, seize the manuscript firmly and remove it from him. When a man talks, his personality comes bubbling through his speech, his voice has animation. His subject is a tool, an instrument, and he handles it deftly because he knows it. If he reads, his voice assumes a monotone, and the audience resigns itself to sleep. The rule is almost invariable! A manuscript that is read does not get across.

When will secretaries, program committees, chairmen et al. recognize this? Probably they do and see no solution to the problem. There is only one solution. Be bloody, bold and resolute! Let nothing interfere with the performance of the one supreme duty. Separate an incipient speaker from his manuscript and say to him, though you spoil a lifelong friendship, "This is no reading lesson! Speak, damit, or sit down!" This will eventually compel the speakers to do two things. It will first be necessary for them to know their subjects. This is not a bad rule for speakers—even engineers and scientists. It will also require them to learn some elementary principles of public speaking. This also would not be a detriment.

Secretaries, program committees, chairmen et al. who are desirous of endearing themselves to their fellow members at a price of three or four friendships should consider this program seriously.

Industrial Stenches— Abatement Versus Elimination

SUPPOSE we were to mention garbage reduction plants, would your nose wrinkle up at the thought of the awful aroma? Most probably it would, and into that same delightful category would go tank house installations operated in connection with meat-packing establishments and rendering plants. So foul smelling are they that frequently the authorities label them (most justly) public nuisances and subject them to stringent regulation as to location and operation.

Recently we published an article by N. K. Chaney and A. B. Ray that offered a solution of the difficult problem. They describe the use of an activated char absorber to remove all odor from tank house fumes. This method has tremendous possibilities of wide application.

Now comes another method that accomplishes the same result. As far as this industry is concerned it is a better method, though this does not detract from the immense practical value of the method outlined by Chaney and Ray of eliminating unavoidable stenches. The other method, presented in an article in this issue —"The Dry Rendering of Fats," by John P. Harris— is simpler, for it eliminates the odors by producing none. Not only is the equipment simpler but the products of the dry process have a higher market value than those from the tank house.

May we therefore be permitted to invoke the old proverb to the effect that an ounce of prevention is worth many pounds of cure? So at least it would seem and we commend to your attention this article as being a most significant technological and economic development.

Fixing the Price Of Chilean Nitrate

ACCORDING to press reports, an official of the U. S. Department of Agriculture has concluded an investigation of the nitrate situation in Europe. In consequence of the existence of a producers' association, controlling about 97 per cent of the output, he says, competition that would insure efficient and economical production is prevented, "and the United States is left without any say as to the price." The present methods of marketing offer no incentive to efficient production, and so prices remain higher than they need be. In theory, it is maintained, the fixing of the price is done by a committee in Chile, but in reality by a sub-committee in London, whose recommendations are almost invariably accepted. The association has performed useful service in some ways, but in general its price-fixing tactics are injurious to consumers.

Little has been discovered that is new, but the reiteration of an important fact is worth while. The comment that "the United States is left without any say as to the price" of Chilean nitrate invites discussion, for it infers that this country could, should or ought to be a factor in helping to fix the price of the product of which it buys so much. The same suggestion has been made in regard to rubber; but if the Department of Agriculture has the record of an important industry that survived overnight after the customers had fixed the selling price, details would be of interest. The point that is never emphasized, seldom mentioned, is that Chile controls more than 40 per cent of the world's output of natural nitrate, and Great Britain almost the same proportion; the price fixing, iniquitous though it may appear from our viewpoint, is done by those who have developed the industry by exploiting the deposit and by supplying the capital needed. Corporations of United States registry control only about 2½ per cent of the nitrate coming from Chile, and therefore it cannot be expected that we should have any appreciable "say" in the fixing of the selling price of a product almost all of which is manufactured by the nationals of other countries. When Great Britain or Chile needs American cotton or Ford cars it has no "say" in fixing the selling price. It is hardly fair to suggest that moral turpitude is in evidence because of the business attitude adopted by the producers of Chilean nitrate.

The fact of the matter is that we are reaping the inevitable reward of the neglect of an important world industry—a neglect that has been technical as well as financial. The number of American engineers of note who have been associated with the Chilean nitrate industry has been pitiably small. The reasons for the apathy of American chemists and the mistrust of American capital are not far to seek: The immediate exhaus-

tion of the Chilean deposit has been persistently expected for many years. The author of "Creative Chemistry," for instance, quotes the Department of Agriculture as authority for the statement that the beds of caliche will last only "a few years." The broadcasting of a conclusion such as this inhibits initiative on the part of American technicians and prevents interest on the part of American capital; and, last but by no means least, it leads to constant friction with foreign nations that are less timorous and that, naturally, fix the price of the commodity they produce. None of the evils that characterize the marketing of nitrate will be removed until we take a more direct interest in the economical and efficient exploitation of the Chilean deposit. Furthermore, the price will harden so long as action is delayed in this country in the development of a domestic synthetic industry. On Sept. 8, 1922, the Federated American Engineering Societies, through the executive board of the American Engineering Council, adopted a resolution authorizing the appointment of a committee of leading engineers to study thoroughly every phase of the Muscle Shoals problem, in order to clear away what was described as a "hopeless muddle," that might lead to grave national disadvantage. This move was welcomed throughout the land, and the Federated Societies gained much kudos in consequence of its decision and timely action. In the meantime, what has it done toward cleaning up the "hopeless muddle"? Nothing! Chile has doubtless kept track of our procrastination, and the Nitrate Producers' Association sees in it no reason for making concessions as to future prices. Whatever the scope of Dr. Bain's mission to Chile, it is to be hoped that his report will contain definite comment and recommendation, and that its receipt will be followed by early action.

Setting the Pace

In Training for Industry

TO CARRY OUT an organized plan of industrial education is a difficult task for a technical society. It is expensive both in the light of financial outlay required and in the necessary expenditure of individual energy. At the same time it is becoming recognized by a few of our more progressive and far-sighted groups of technical men that one of the greatest demands of industry from the present time forward is to be intelligent and more adequately educated workmen. The Technical Association of the Pulp and Paper Industry is one of the pioneer organizations to face this situation squarely and take definite measures to meet it. As a result a fixed policy of vocational education within the industry has been adopted.

The association is preparing a set of five authoritative texts covering the pulp and paper industries from standing timber to packaged product. Every phase of manufacture is considered, discussed, explained. The last three volumes deal definitely with problems of pulp and paper production, while the first two are so written as to offer the workman with a grammar school education full opportunity to lay the necessary groundwork for grasping the more complicated principles entering into the actual manufacture of the products of the industry. The value of the texts to the workmen is increased by the fact that several schools and universities in this country and in Canada are offering their assistance in making it easy for them to master the subject matter through correspondence courses. And in this connection it is to be noted in one large plant where such a course has been carried out with conspicuous success that the men in the mill have been enthusiastic in their reception of the idea.

It is for these men primarily that the work of preparing these volumes has been done. The total expense of publication has not been less than $40,000. In addition to the money outlay involved many of the members of the association have given liberally of their time in writing and in criticising the contents of the several volumes, the better to insure their absolute accuracy. It is certain that, in addition to performing a real service to workmen now in the industry and to those recruits who are to be added to their ranks, the latter three volumes will have definite value to the members themselves. While this is a secondary consideration, there can be no gainsaying the fact that the crystallized standards and principles set forth therein will enable the members of the association to work more closely together.

The value of the practical man who has acquired the essential technical background underlying his work is infinitely greater than that of the man who works blindly, and such a workman derives a greatly increased pleasure and satisfaction in his occupation. The Technical Association of the Pulp and Paper Industry has adopted a policy that commends itself to the attention of other societies and industries. It constitutes a step long needed and of great value. This effort marks a milestone in the progress of industrial education.

"A Danger to Scientific Progress"

Bouquets and Brickbats

A WISE EDITOR once said: "Don't make your paper a sailboat driven by the wind of opinion, for occasionally you will be caught in opposite gales and destruction will follow. Put in a motor of ideals and convictions built of the strong steel of human contact and tempered with the fire of righteousness and truth. Then you may steer a straight course, a progressive course."

Herewith we are publishing two letters in part. They bear witness to the wisdom of this advice. Both letters discuss our editorial "A Danger to Scientific Progress" that appeared in the June 25 issue of *Chem. & Met.* Both of these authors are with the same corporation, one a chemical engineer, the other an engineer.

Says the former: "I was very much surprised at the character and contents of the editorial entitled 'A Danger to Scientific Progress.' There is much that I feel I might say, but why waste words over such a silly ass as the author of such an uncalled-for, unwarranted and illogical defence of science must be? Kindly cancel immediately my 2-year subscription to *Chemical & Metallurgical Engineering.*"

While the latter says: "My congratulations and thanks to the man who is responsible for the editorial 'A Danger to Scientific Progress' in your issue of June 25, 1923. And while I am writing, let me add that I like your paper, get a lot of good out of it, and that I like a good many of the physicochemical books McGraw-Hill are getting out."

Of course it is impossible to please everyone and if it were possible it would not be wise. In any case it is not an end for which to strive. So the brickbats may be disquieting and the bouquets reassuring, but neither should affect our vision of progressive idealism.

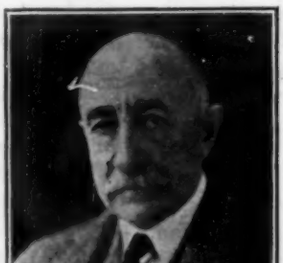
A New Era in Industry

The Report of the Coal Commission on the Anthracite Industry Is Significant, as It Shows That Public Necessity Has Become a Paramount Consideration

WHEN the personnel of the Coal Commission was announced by President Harding, a wave of hopefulness spread over the country, and with reason. John Hays Hammond, chairman; Thomas R. Marshall, former Vice-President of the United States; Clark Howell, editor of the Atlanta *Constitution;* George Otis Smith, director of the U. S. Geological Survey; Edward T. Devine, lecturer, economist, sociologist; Charles P. Neill, former labor commissioner and an expert on railroad labor problems, and Judge Samuel Alschuler, whose appointment could not be confirmed as he was a federal judge and was unable under the Constitution to hold more than that one office. The commission was representative and as such its findings were bound to have the serious consideration of the Congress, the coal industry and the public.

Their first report on the anthracite industry was made public July 9. In itself it is not so significant as the bituminous report which is due Sept. 22, but it is dramatic as a sane, balanced, courageous gesture. The wave of hopefulness has received complete justification. It is difficult to see how Congress or the industry can or will want to evade its recommendations. The new era is one wherein public necessity is recognized. An adequate return on capital has always been one fundamental and several decades ago the minimum wage began to make itself felt. Through the war and after it, these two principles have warred so ruthlessly that there has been anxiety, shortage of a vital necessity and a great deal of suffering. The rights of the public have been disregarded. The report of the Coal Commission recognizes public interest and public necessity to be imperative and to have prior rights above capital and labor in emergency.

In its more general recommendations the report is statesmanlike. It does not favor a paternalistic control of the industry. Rather it puts the problem squarely up to the industry itself. Modernize your wage agreements and the conciliation board that interprets them. Set up an adequate inspection service, etc. But in case of the industry's failure properly to discharge its own responsibility, thereby stopping the flow of coal long enough to imperil the public interest, then let the government take over "the operation of the mines, the transportation, distribution and marketing of the product, with full power to determine the wages to be paid the mine workers, the price at which coal shall be sold and, subject to court review, the compensation paid to land and mine owners."



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John H. Hammond

Chairman of the Coal Commission. A distinguished engineer whose leadership of this inquiry into the coal industry will add prestige to his already great name.

And then again, "The commission recommends at this time no punitive legislation. It calls attention to the fact, however, that some of the material from both the operators and the United Mine Workers presented to it is calculated even if not intended to inflame the public mind for or against one of the parties. This is more applicable to the bituminous controversy.

"These charges and countercharges are most unfortunate at this period of negotiations. Instead of preparing the public mind as to what will be real justice to the operator and the miner and what will stabilize the industry, there has been too much of epithet, too little of argument. The commission recommends that each side forget past differences and grievances and attack the problem in the spirit of justice and fair dealing, not only between themselves but with due regard for the rights and sensibilities of the American people. The commission hopes that a constructive view will be taken, not controversial in its character, so as to assure a continuous output from the anthracite mines and the scrupulous keeping of the agreement. If it must fix responsibility because the old order has not changed, it cannot do so without taking into consideration the bituminous industry."

With utter disregard for chronology, here at the end is the preamble to the commission's report. It is not inappropriate that we should close with it. It represents a goal that was worked for and achieved. It is a text, a slogan and a program of work that may well serve as a model for the commissions that will be appointed to undertake similar tasks in other industries during the years to come. It is inevitable that this achievement will mold industrial history:

"Both the Congress and the American people are concerned in the questions whether in the anthracite industry a reasonable return on investment can be paid to the owners and operators, decent living conditions and an adequate wage based on American standards furnished to the mine workers, a proper return made to the railroads and the dealers, and coal be delivered to the patrons of the industry at lower prices than those now charged. Furthermore, they want to know what can be done to assure an ample supply of anthracite with a constant flow from mine to consumer. Peace with justice in the industry is the first requisite and economy is the second. To these inquiries the Coal Commission has directed its attention."

A Notable Technical Development

The Dry Rendering of Fats

Until Recently Most of the Edible and All of the Inedible Lard, Tallow and Grease Have Been Made by the Wet Method, Contrasted in This Article With a New Dry Method Which Eliminates the Tank House and Gives a Better Yield of Higher Grade Products

By John P. Harris
Chemical Engineer, Kansas City, Mo.

ONE of the most fascinating of American industrial romances is the inception and development of the meat-packing industry, growing in a few decades from the humblest and most unpretentious beginnings to a tremendous power and influence in modern industry, and representing a staggering amount in capital invested and in the employment of labor. The founders of this industry were frowned upon as "ordinary butchers and slaughterers," but their foresight and industry, together with the scientific application of modern machinery and methods, have caused the modern packer to be treated with respect. Any new development of the meat-packing industry is of general interest, and of special interest to technical men, particularly to chemical engineers. From this angle, the present article deals with that important phase of the meat-packing industry known as rendering.

Apart from its advantages in meat-packing establishments, this system of rendering promises to revolutionize the detached rendering plant, the small soap factory and the municipal garbage plant. The initial cost of equipping a detached rendering plant for handling the customary shop fat, carcasses, etc., is tremendously reduced—in fact, it is about 30 per cent of what it formerly was. Thus the independent renderer starts in business with an overhead of only about 30 per cent of what he formerly had and proceeds to operate at less than one-half the cost in labor, power, steam, etc., at the same time securing a much higher price for his products and a better yield. Also he ceases to be a public nuisance and is not constantly menaced by the municipal board of health, and he finds it vastly easier to secure and maintain the necessary labor. The small soap manufacturer is enabled to install, inexpensively and satisfactorily, a method of producing the grease and tallow necessary for his purpose, operating inexpensively and producing maximum results, without becoming a menace to the community. For municipal garbage disposal the author predicts that this will eventually replace all the other systems, as it means that the garbage will be entirely shredded, the fat melted out of it, and it will be dried immediately, effectively and continuously in a sanitary manner.

Rendering is the separation of fats from tissue, etc., by means of the application of heat, the object being to produce as dry, clear, sweet and neutral a rendered fat as possible. Every animal slaughtered contains considerable quantities of fat distributed throughout the carcass, some of which is easily rendered, while other portions are very difficult to separate and handle. That part of the fat which can be secured uncontaminated is designated as edible, while the contaminated fat is termed inedible.

At all inspected slaughtering establishments, this separation occurs upon the killing floors or in the offal department in the process of eviscerating, and is under the supervision of veterinary surgeons employed by the Bureau of Animal Industry, United States Department of Agriculture. The inedible fats are delivered to the inedible tanks, which are situated in an entirely separate building, having absolutely no connection with the edible buildings. The inedible fats are also treated with denaturing agents to preclude further the possibility of their ever being used for edible purposes.

The most easily rendered and best quality fat occurs around the ribs of the animal. In hogs this is known as the "leaf" and in cattle and sheep as "oleo." This fat can be pulled right off the ribs of the carcasses and yields upon rendering the firmest and best flavored fat in the animal; the fatty acids show from 1 to 6 deg. C. higher titer test than the fats from the other parts of the animal. The heavy fat from the back of the hogs is also very easily handled, and produces a finished lard only slightly inferior in hardness and sweetness to the leaf fat.

This fat is treated according to the use to which it is to be put. If it is intended as a high-grade cooking fat, it is hashed up, using an Enterprise hasher with ½- to ⅝-in. plate and cooked in a steam-jacketed kettle under violent mechanical agitation, with about 30 lb. steam pressure in the jacket of the kettle, until all of the tissue (known to the trade as cracklings) becomes nut brown and floats freely on the top of the kettle. This also shows that the last trace of moisture is driven out of the fat. The lard is then strained through heavy drilling to eliminate the tissue.

This tissue, even when carefully drained, contains a very high percentage of lard, and various methods of recovering this lard have been resorted to, including tanking the cracklings together with the less desirable fat and rendering under pressure by the wet method, hereinafter described, or pressing by means of a hydraulic press. But the most effective method is the use of the Anderson expeller (see Fig. 4), which not only extracts a high percentage of the lard from the cracklings and at the same time secures a higher price for the lard than when the cracklings are tanked but, being continuous in operation, eliminates most of the labor of hydraulic pressing. This method was the forerunner of the new system of dry rendering as applied to the less desirable, and harder to render, parts of the fat.

Lard that is properly and carefully rendered accord-

ing to this method leaves little to be desired. It contains less than 0.2 per cent free fatty acids, is very sweet in flavor and will remain sweet almost indefinitely. The writer recalls inspecting a shipment thus rendered which had been in stock at an Oklahoma branch house of one of the large packers for more than 2 years without any refrigeration. It was expected that the lard would be very rancid, but it proved to be just as sweet and neutral as the day it was made.

Water-Jacketed Kettles Yield Neutral Fats

However, fats rendered in this way are not suitable for use in the manufacture of butter or lard substitutes on account of the high (though delicious) flavor and the presence of free fatty acids. Therefore the approved method of rendering for this purpose, including hog, beef and mutton fats, is to render the fat in water-jacketed kettles at as low a temperature as possible, thus producing a rendered fat absolutely neutral in flavor and containing practically no free fatty acids.

Objectionable Features of Tank House Rendering

All of the lard produced by the above-described process is very satisfactory, but unfortunately this constitutes only about 15 per cent of the pure lard produced. The remainder, being produced by the wet method, is commonly known as prime steam lard, and much of it is incipiently rancid as marketed.

Prime steam lard, tallow and grease have been produced for the past 40 years by a process the present form of which is indicated diagrammatically in Fig. 1. Trimmings, together with a large amount of fat-bearing bones and offal, are added to a considerable volume of water in a closed vertical pressure tank, and cooked under pressure with live steam until the fat is completely separated from the tissue, etc. The rendered

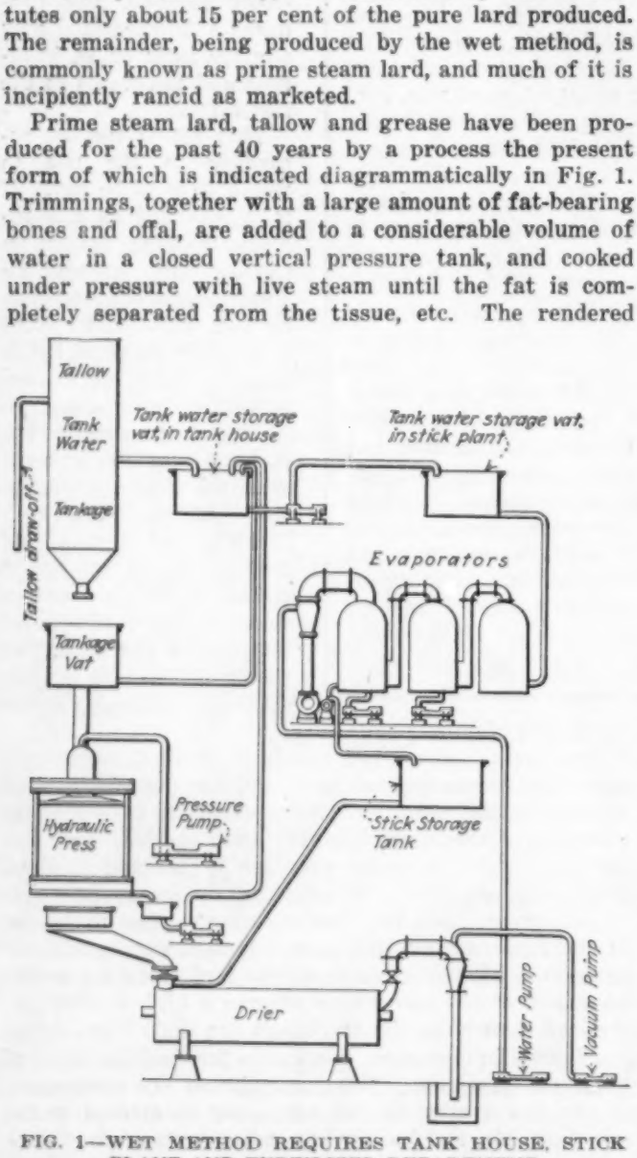


FIG. 1—WET METHOD REQUIRES TANK HOUSE, STICK PLANT AND FERTILIZER DEPARTMENT

lard or tallow is then decanted off, settled out and later refined.

After drawing off the tank water, which holds in solution about one-third of the solids delivered to the tank, the solid residue or tankage is discharged into a vat, where it is allowed to drain, the liquid being returned to the tank water storage. A further quantity of tank water is recovered from the hydraulic presses which serve to initiate the operation of drying the tankage. This step is completed by breaking up the press cakes and feeding them through steam-heated or direct-fired rotary driers. In the meantime the tank water has been put through a multiple effect evaporator, from which it emerges as a thick, viscous, evil-smelling liquid known as "stick." To facilitate further drying, this is mixed with the tankage just as it enters the drier. The dry product is used for fertilizer.

Objections to the wet method of rendering are, briefly, as follows:

1. The fats produced are very high in free fatty acids, running from 0.4 to 0.9 per cent higher than the same fats when rendered in open kettle in the case of edible fats, and very much higher in the case of inedible fats.

2. The lard, grease and tallow are much stronger in flavor and odor. In the case of prime steam lard, the usual practice is to bleach with fullers earth at high temperatures, during which operation the melted lard is violently agitated either mechanically or with air (which is a particularly bad practice, as it always causes oxidation and thereby rancidity).

3. This system is very insanitary and is responsible for the very worst of the packing house odors. Decomposition accompanies this process, and the tank water and tankage have a truly awful odor.

4. Twenty-five to 30 per cent of the ammoniates is driven off from the tankage.

5. On account of its vileness, this tankage is fit only for fertilizer, whereas it should be a high-grade poultry and stock feed.

6. The expense of operation is exceedingly high. It takes a great deal of steam to render, and much more to evaporate, the tank water and dry the tankage, the labor cost of pressing the tankage is excessive and only the lowest class of labor will consent to work around such a place for obvious reasons.

Efforts to Eliminate Tank Water

It is therefore quite natural that progressive packing house men have been anxious to provide a remedy for this state of affairs, and a great deal of work has been done looking toward an improvement in the last few years.

Endeavoring to eliminate the tank water, some plants adopted the plan of hashing the fats directly into a horizontal steam-jacketed drier. The product was then cooked from 3 to 5 hours and allowed to settle, after which the grease was drawn off and the drier again put into operation to dry the residue completely. The objections to this system are that the rendered fat yield is low and the tankage dark in color and high in grease.

A horizontal steam-jacketed tank, commonly known as a fat melter or cooker, has been used in rendering soap grease and tallow for years in small soap plants, the fat being charged into the melter and cooked until the fat was completely separated from the tissue, etc., and the product was nearly dry.

After settling, the rendered fat was decanted off.

The remaining sludge was placed in a curb press to eliminate all the fat possible, and the resultant cracklings were sold as a high-grade poultry food. The grease content of these hydraulic-pressed cracklings was so high that it was necessary to degrease them, using naphtha as a solvent, or else break them up and run them through an Anderson expeller (the grease content, direct from the melter, being too high to handle in an Anderson expeller). This made the handling prohibitively expensive.

A Successful Dry Method at Last

Myrick D. Harding, general superintendent of Chicago's largest meat-packing establishment, was the first man to arrive at a real solution of this problem, which he accomplished by his invention of the fat percolator, using this percolator in combination with an improved melter and a special Anderson expeller. He has developed a complete new system of rendering now known as the dry method of rendering, which is being successfully operated in some of the leading plants throughout the country.

Fig. 2 illustrates the complete system, including hasher and washer, as handled by the Cincinnati Butchers' Supply Co. For edible material, a jacketed hasher is used instead of the gut hasher and washer shown.

The hashed fat is charged into a rotary fat melter, which consists of a steam-jacketed horizontal rendering kettle provided with a mechanical agitator, whereby the fat is kept in violent and even agitation, the fat being separated meanwhile from the tissue, bone, etc., by the application of 60 lb. steam pressure to the jacket. Fig. 3 shows construction details of one type of jacketed melter. After separation is completely effected (the contents of the kettle being simultaneously dried), the discharge door is opened and the entire contents of the kettle are discharged into the fat percolator, which consists of a shallow cone-bottomed tank, so arranged that the rendered fat percolates through to storage, while the solids are retained in the percolator but are afforded such opportunity of draining that they are dry enough to be effectively fed directly from the percolator to the Anderson expeller, from which the hard dry

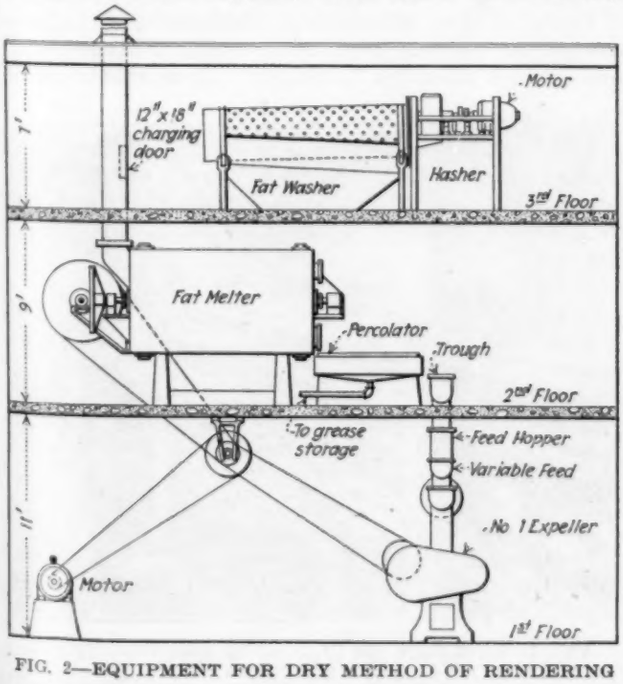


FIG. 2—EQUIPMENT FOR DRY METHOD OF RENDERING

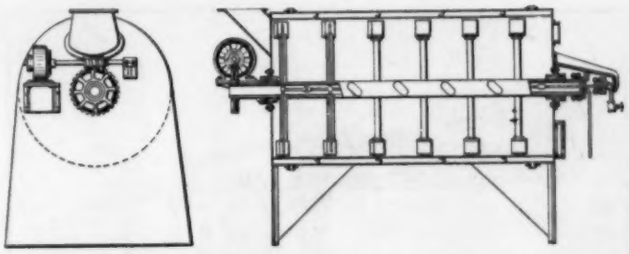


FIG. 3—STEAM-JACKETED FAT MELTER

cracklings are discharged in cake form. According to tests recently made, the average per cent of fat remaining in the cracklings is as shown in Table I.

The resultant cracklings are usually ground up and make a very high-class poultry and stock feed, being very high in protein and being greatly relished by the chickens and stock. The lard produced is dry and sweet. It resembles open kettle lard in flavor and odor much more closely than wet method lard, although it is somewhat darker in color, and is very much lower in free fatty acids (running about 0.2 to 0.4 per cent, as against 0.6 to 1.0 per cent when using the wet method) and the keeping qualities are vastly improved, being nearly as good as open kettle lard, dry, sweet and neutral. Prices obtained for cracklings from dry method rendering average about 2 or 3 cents per pound higher than for ordinary wet method tankage.

An Anderson expeller fitted up especially for dry method rendering is illustrated in Fig. 4, and while a hydraulic press may be used here to advantage, the expeller is superior, because it is continuous in operation, greatly assisting in rapidity of production and cutting the labor cost to the very minimum, as it is easily and simply operated. All parts are direct-connected to motor, so that when the main clutch on the machine is disengaged the entire equipment ceases operation, and inasmuch as the machine works automatically it is not necessary for the operator to confine his entire attention to its operation, even though he may be operating four or five machines simultaneously. The temperature is easily controlled by means of the variable feed-tempering apparatus, which constitutes the upper part of the machine.

TABLE I—EFFICIENCY OF FAT REMOVAL BY EXPELLER

Material Pressed	Yield in Fats, Per Cent	Fat in Cake, Per Cent
Oleo scrap	56.9	5.66
Cold scrap cracklings composed of stomachs, gullets and bags	29.9	6.52
Pecks, rennets and sheep paunches	29.6	5.26
Cracklings from calf and sheep guts	49.6	7.8
Cracklings from black hog guts	39.2	6.7
Shop fat cracklings	38.2	5.48
Cold pressed cracklings	36.58	5.48

Material from the percolator is fed directly to the variable feeder, and the feeder can easily be regulated to discharge the desired amount into the tempering apparatus, the latter being a steam-jacketed trough, fitted with an agitator shaft which slowly passes the material to the pressing cylinder of the expeller. While it moves along it is warmed sufficiently to start the fats and thus assist the expeller in obtaining the desired results.

Each expeller is provided with a steam-jacketed oil pan built into the expeller frame. This pan is directly under the pressing cylinder, so that when the expeller is not in operation the pressing cylinder is kept warm enough to prevent the fats from congealing. The cake is discharged from the expeller in pieces $\frac{1}{2}$ to $\frac{3}{4}$ in. thick,

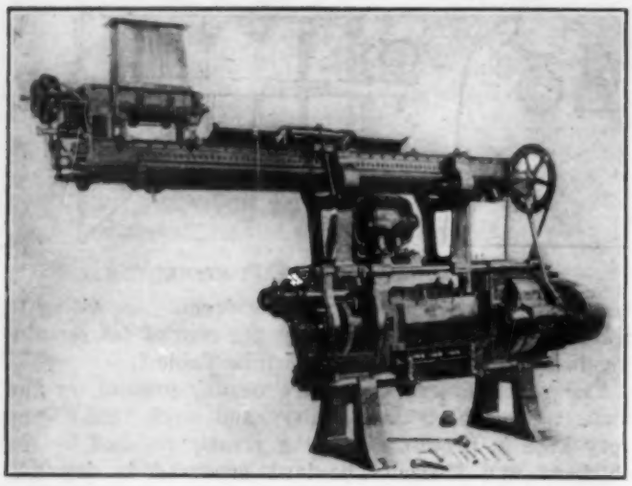


FIG. 4—ANDERSON EXPELLER FOR USE IN DRY RENDERING

ranging in size from 3 to 10 in. and is easily broken up or ground, as desired.

As already noted, Fig. 1 represents a modern wet method tank house, illustrating the elaborate equipment which is not only expensive to install but is very expensive to operate, requiring a large quantity of steam for the rendering kettle, the evaporator and drier and power for the hydraulic press and drier and, above all, a great deal of labor in pressing and transferring, and a long time in operating. It takes from 48 to 72 hours to bring the raw material from the killing floor to a finished product.

Contrast this then with the simple equipment in Fig. 2—inexpensive to install and operate—which will bring the raw material to a vastly superior finished product in from 6 to 7 hours.

Byproduct Department Becomes Desirable Place to Work

It has been indicated that the tank house is the seat of all the most obnoxious odors around a meat-packing establishment. This dry method practically eliminates this condition. In operating by this dry method all products are handled absolutely fresh from the killing floor. They are washed and hashed and the bones crushed immediately. The blood is cooked and dried in one operation. Naturally, all products entering the melter are fresh and sweet, and remain so sweet and fresh, even through the process of rendering, that no special equipment is necessary to avoid disagreeable odors. It is a matter of constant bewilderment to the old packing house employee to stand at the outlet of one of these fat melters during the process of rendering, without observing any disagreeable odors whatsoever. Furthermore, after rendering, since there has been no possible chance for decomposition, the contents of the fat melter smell fresh and sweet, and this extends clear down to the cracklings when finally ground, so that the entire atmosphere of the dry-rendering establishment is sweet and pleasant.

The morale of the employees of this department is wonderfully improved. From the most objectionable department in the plant, it becomes one of the most desirable, so that the highest type of labor men can be secured and proper sanitation easily maintained. Insanitary conditions are abolished entirely, there is no water or slop around the presses, under the tanks and on the floors, and this department can be easily kept as clean as a first-class hotel kitchen without any special effort.

The writer believes that this is the most important step forward made by the meat-packing industry in its entire history, and he makes the confident prediction that every successful meat-packing establishment of any size will change to this dry method of rendering within the next 2 years and that detached renderers, soap manufacturers and garbage disposal plants will not be slow to follow.

Equipment That Saves Floor Space

How a Machine Developed for Use in the Bakery May Be Adapted to Use in Other Fields and Aid in Solving Many Problems

By Graham L. Montgomery
Assistant Editor, *Chem. & Met.*

SOMETIMES a device is developed for a particular purpose and obtains wide acceptance for this use without its possibilities in other fields attracting much attention. The cooling conveyor mentioned in the article entitled "The Chemical Engineer in Bakery Management" in *Chem. & Met.* for July 2, 1923, is such a device.

As designed for bakeries, this equipment consists essentially of two endless belt conveyors, one above the other, as shown in Figs. 1 and 3. Each of these belts is made of two strands of chain with separators in the shape of trays between. The chain, as can be noted from the illustrations, is of the familiar roller-type, as used in slat, apron and pan conveyors.

The trays consist of a light iron frame made up of four pieces riveted into a rectangle about 18 in. wide and 12 ft. long. At intervals along the length of this rectangular frame struts are attached to give greater rigidity. To the top and bottom of this frame wire strips of small diameter are attached to form a carrying surface. These trays are, then, double-surfaced. They are of sufficiently open construction to permit a free circulation of air through them.

The method of attaching the trays to the chains is unique. At opposite points on the chains are stud shafts, one on each chain for each tray. These shafts extend

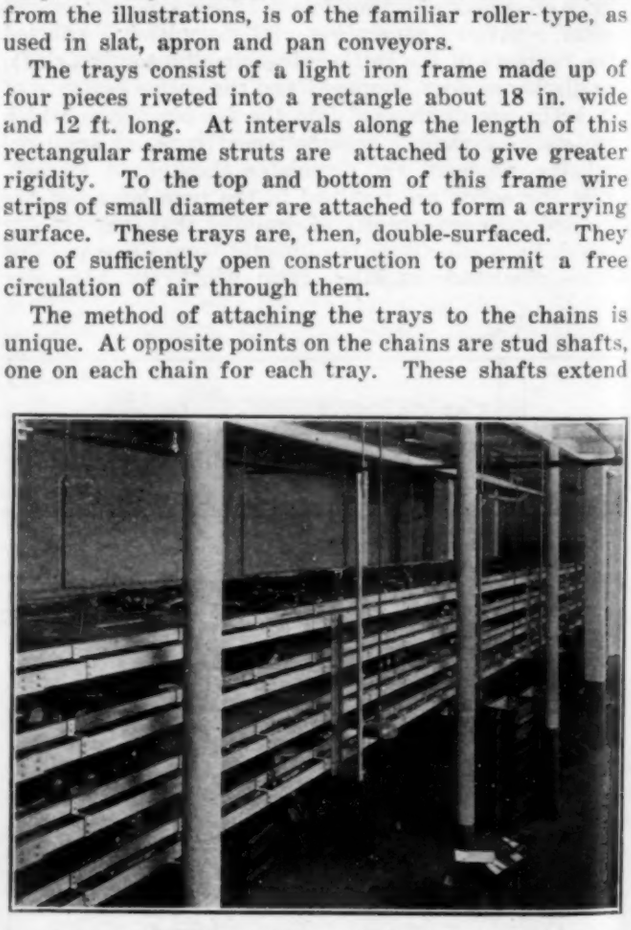


FIG. 1—SIDE VIEW OF CONVEYOR, SHOWING TRACK AND SUPPORTS

through the side bars of the tray frames in bearings loose enough to permit the tray to swing freely. To each side bar of each tray are affixed two rollers. These rollers, when the conveyor is in operation, run on tracks and hence serve to govern the position of the tray, maintaining it at the horizontal or inclining it at whatever angle the conveyor may be designed to require.

This track shows plainly in the illustrations. Fig. 3 shows how the track is designed at the end of the run in order to cause the trays to tilt and deposit their loads gently on the horizontal run of the belt immediately below or on a conveyor installed for the purpose of carrying the material away. This illustration also shows the arrangements for drive and take-up.

There are several things about this equipment that lead to the belief that it would be useful for other purposes than for cooling bread while it is being conveyed from the ovens to wrapping machines. First and foremost, note that because of its construction, material passing along it may be made to travel back and forth as many times as the construction may be duplicated. This permits the necessary length of travel in various processes to be accommodated to limited spaces. The construction is such that goods can be changed from one direction of travel to the opposite, from one strand of the belt to that directly beneath with a minimum of jarring and disturbance. The construction can be varied to suit different products and different environments. The machine can be inclosed in a separate room when it is desired to use heat in connection with it. Due to the nature of the trays, it is possible to have the goods travel along the conveyor in containers where this is desirable.

With these possibilities of adaptation in mind, let us consider some of the places where the use of the equipment seems to be indicated. In the first place, it would seem to be worth considering wherever heating, drying and cooling are used in the course of a continuous manufacturing process. In such a place apparatus of great length which occupies much valuable space is often used. With the conveyor here described the length required may be divided by 2 or any multiple of 2, depending upon how many of the endless belts are installed. Thus the effect of a very long machine can be obtained in small space and certain processes can be used in existing buildings where with other equipment their use would be prohibited.

FIG. 2—TOP VIEW OF CONVEYOR SHOWING CONSTRUCTION OF TRAYS

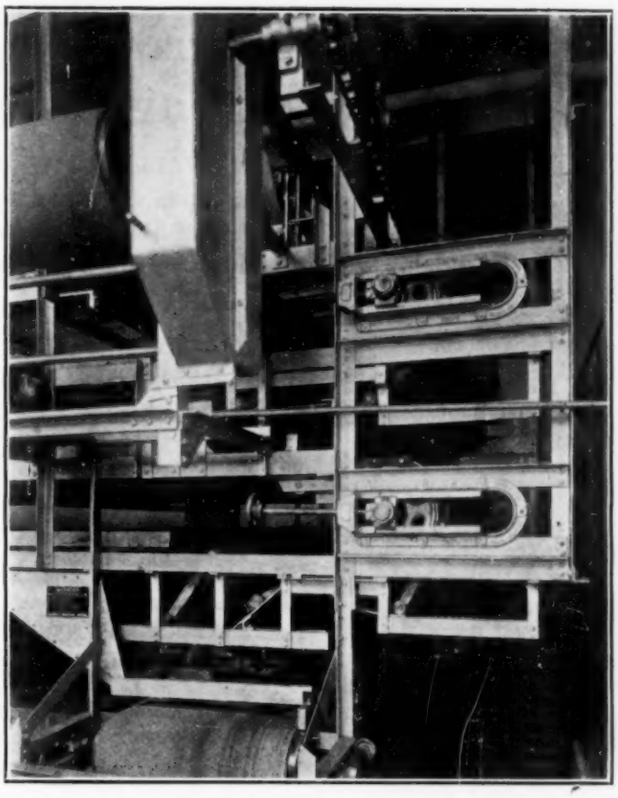


FIG. 3—END OF CONVEYOR, SHOWING DRIVE AND TAKE-UPS

Among the processes where this conveyor might be adapted we mention the following: the annealing of glassware, the cooling of various types of ceramic products directly they leave the kilns, and the drying of porcelain, potteries, brick, tile and refractories prior to burning. Other uses might be found in the metal industries where the annealing of various metals and the cooling of castings are suggested. In the leather industry much valuable space is occupied by driers and drying lofts. It is possible that this equipment could be applied as a means of reducing these space requirements. Another application would be found in the drying of soap cakes after they leave the cutters and before they enter the molding presses. Other uses might be found in the manufacture of food products in addition to the original use in bakeries.

We believe that other applications of this machine will readily present themselves to the minds of those interested. Enough has been said to suggest the extension of the use of a device that has proved valuable in one industry. The manufacturers, Mathews Gravity Carrier Co., Ellwood City, Pa., will doubtless be able to help those interested in seeking to use it in their plants.

A Durable Varnish

A new finish of the varnish type for wood and metal has been developed. It is claimed that this is so durable that it will resist high degrees of heat and hot or cold liquids. It is described as so absolutely waterproof—that is, it can be washed with soap and water.

The new material, which is known as viscolac, is now in use in many wood and metal working industries, including the manufacture of automobiles and furniture. It is a pyroxylin solution, which is developed from cotton.

European Practice in Cooling Chemical Liquids

Though the Cooling of Liquids Appears to Be a Very Simple Process, Great Strides Have Been Made in Recent Years to Reduce the Bulk and Correspondingly the Price of Such Coolers by Increasing Their Efficiency, at the Same Time Attaining the Greatest Simplicity of Design and Ease of Operation

BY A. THAU
Halle, Germany

THE oldest and simplest method of cooling liquids consists of conducting the liquid through a coil such as shown in Fig. 1. Channel iron supports and angle braces form a framework that carries several rows of pipes, which if the nature of the liquid to be cooled permits, should preferably be made of wrought iron so that the pipe walls may be as thin as possible. In Fig. 1 four parallel rows of pipes are shown and the vertical rows are connected to one another at the ends by U-bends, thus forming a coil. The liquid is introduced at the bottom through the large distributing pipe, which is provided with a branch and valve for each coil.

In exactly the same manner, though not shown in Fig. 1, the upper horizontal row of pipes is connected at its end to a collecting pipe, so that each vertical pipe coil can be cut off from the circuit for repairs or in order to reduce the cooling effect of the apparatus, which with this type of cooler depends much upon the season. The supporting frames carry on top of each vertical coil a water trough with serrated upper edges, corresponding in length to the coils. The troughs must be so situated that the overflowing water runs over the coils. The whole cooler is built over a collecting tank, from which the water is either allowed to run to waste or pumped over a surface condenser. To enable the cooling water to play upon the whole outer surface of the coil, the tubes must be in an exact parallel position and to prevent them from bending sideways through expansion, they are rigidly held to the frame by clamps.

Coolers of this type are built in lengths of 30 ft. and

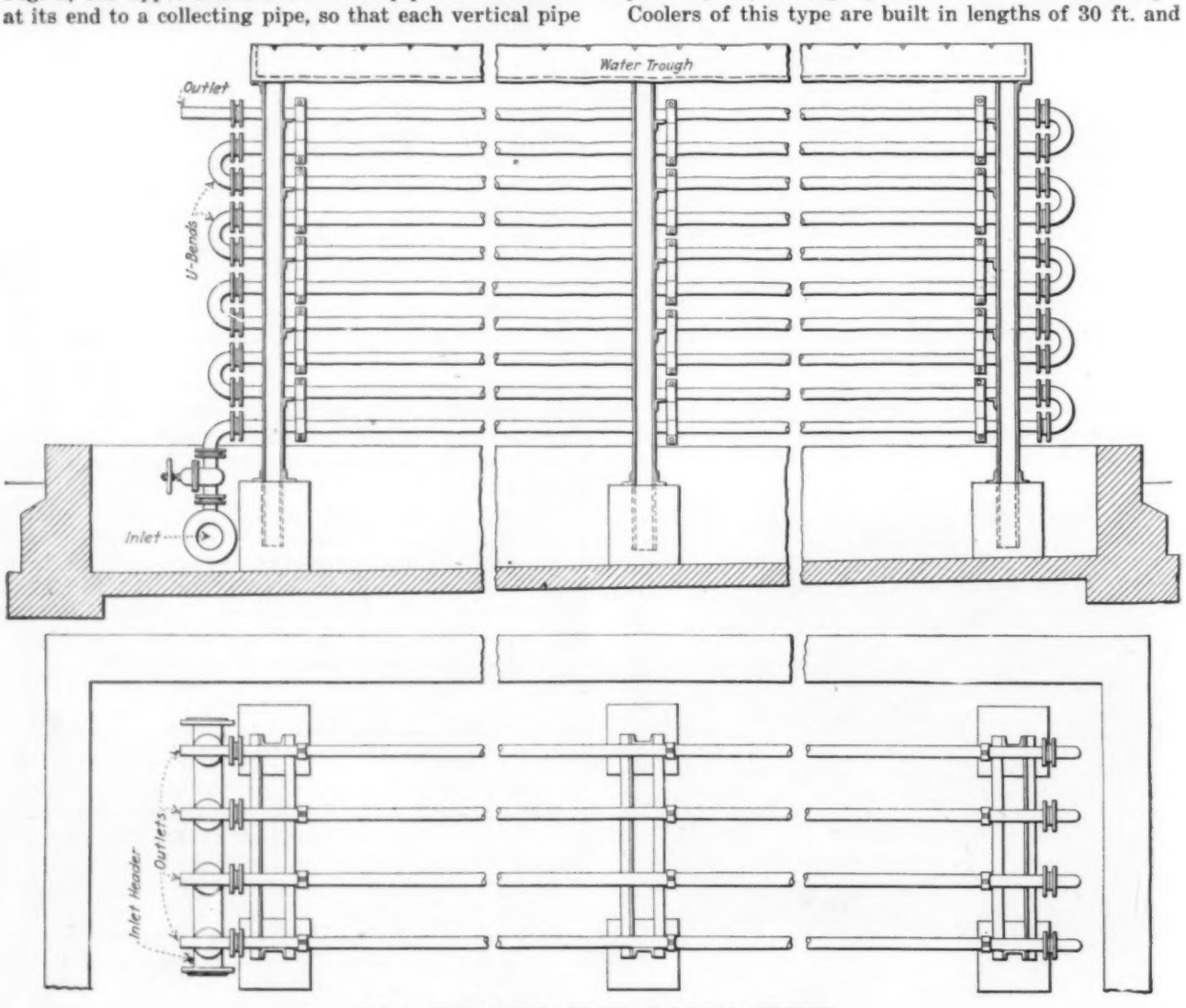
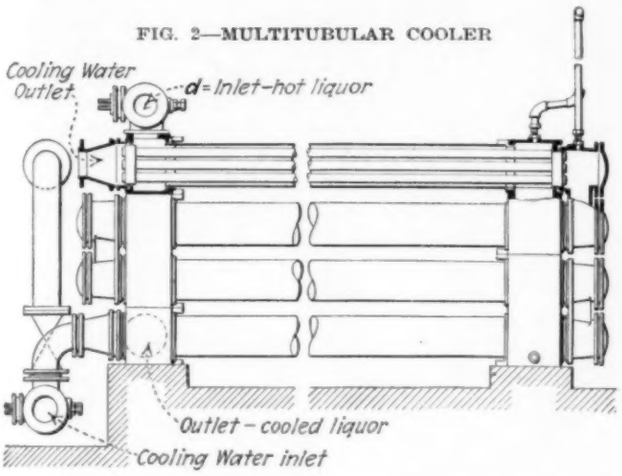


FIG. 1—ELEVATION AND PLAN OF COIL COOLER

FIG. 2—MULTITUBULAR COOLER



more. They offer an advantage in that leaks are observed almost immediately. Their disadvantages are that the efficiency is comparatively small, being largely dependent upon the season, and that they require much ground space. They can, to reduce the space occupied, be extended in height; or the coils can be arranged more closely in the horizontal as well as in the vertical direction; but the efficiency is thereby not increased proportionately to the greater area of cooling surface provided and the cooling water running down the outer surfaces of the tubes soons reaches the temperature of the tubes themselves.

If such coolers are erected in unprotected places, wind coming sideways disturbs the downflow of the water and seriously impairs the efficiency. In such cases wooden louver grids must be erected upon the longer walls of the bottom basin so as to admit the air but to check horizontal currents which divert the flow of water. Coolers of this type are particularly recommended where sea water must be used as a cooling medium and is run to waste after having passed over the cooler. While for most liquids wrought-iron pipes may be used, for others cast iron must be applied. In the latter case ribbed pipes should be used in which the thickness of the pipe walls can be a minimum and their radiation surface much increased. Also wrought-iron pipes with ribs cast around them have been tried with advantage, increasing the pressure capacity of the pipes and the radiation surface at the same time.

To insure the best efficiency of such coolers, an equal and sufficient distribution of the cooling water is essential. The arrangement, as shown in Fig. 1, with a trough on top is recommended for plants having at their disposal an abundance of water. Where water is scarce and a comparatively clean water free from solids and salts is available, it is of advantage to arrange a separate water-spraying arrangement over each pipe so that just sufficient water is supplied to cover the whole pipe surface and to evaporate completely. Such an arrangement increases the cooling capacity considerably, but requires a certain amount of attention, particularly if the operation of the plant does not run evenly at all times. Where dirty water or sea water is used, it is better to increase the supply so much that no evaporation at all takes place so as to prevent any solids from being deposited upon the outer pipe surfaces, as these would reduce the cooling capacity considerably with increasing thickness.

A very efficient type of liquor cooler is show in Fig. 2. It consists of two cast-iron distributing chambers, which are connected by large diameter pipes. The upper pipe in Fig. 2 is shown in section and in the housings can be seen a number of machined holes into which the ends of seamless tubes are expanded. Each large pipe receives five to seven tubes, of which one is placed in the center and the others in a circle around it. Fig. 2 shows a cooler consisting of four outer pipes per unit. Fig. 3 shows a cooler of two units with five outer pipes each. Fig. 4 shows a cooler of three units with six outer pipes each.

In such coolers the cooling water runs through the internal bunch of tubes, while the liquid to be cooled occupies the space around the inner tubes in the large pipes. Cooling water and liquid flow counter-current to each other. The hot liquid enters the cooler shown in Fig. 2 by the upper pipe *d*, which is provided with a cock or valve. It travels through the outer pipes in a zigzag way through each unit and is cooled by the transmission of the smaller cooling tubes. It leaves the lower pipe by the cock connected to one side, either to return to the circuit of the plant or to repeat the same travel in one or more similar cooling units.

In order to prevent the collecting of air or steam which would interrupt the regular passage of the liquid and the water through the cooler and impair its efficiency, the liquid and the water space of each cooling unit as well are provided with vent pipes. These extend to a sufficient height to balance the pressure at which liquid and water are passing through the cooler. To facilitate cleaning the cooling tubes, the headers are provided with projecting pieces closed by removable lids in line with the outer pipes so that the tubes can be inspected, cleaned, repaired or exchanged within a short time.

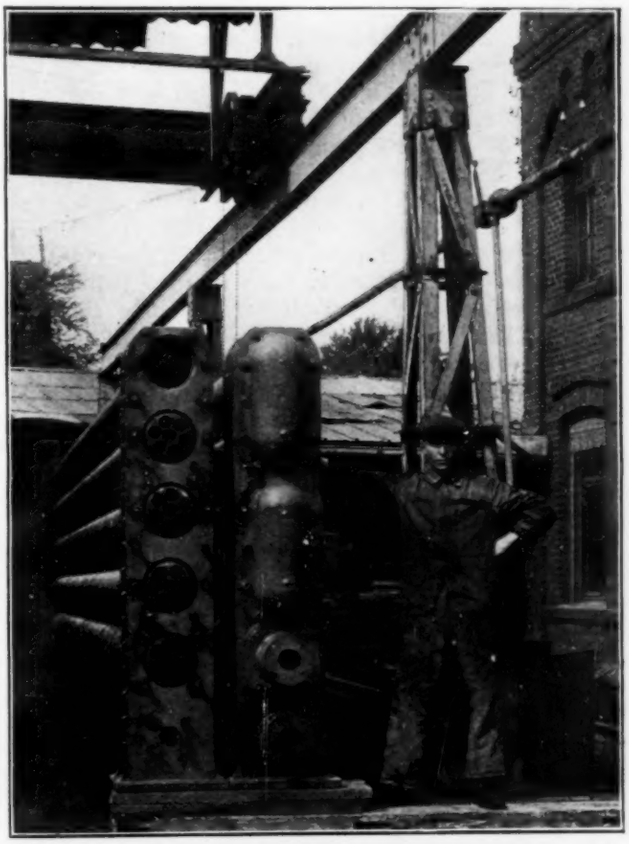


FIG. 3—MULTITUBULAR COOLER, SHOWING ARRANGEMENT OF TUBES AND HEADER

FIG. 4—MULTITUBULAR COOLER, SHOWING CONNECTIONS AND CONTROL VALVES

The construction of such coolers can best be recognized from Fig. 3, where a cooling unit consisting of five pipes, each pipe taking seven cooling tubes, is shown. In the upper pipe the end piece is in its proper position at the back wall of the header, into which it fits tightly by its machined and slightly tapered edge. In the four lower pipes, the end pieces with their tubes are pushed to the front end of the header to show the arrangement better. The possibility of withdrawing the tubes through the openings of the header without having to dismantle the cooler is also evident.

Coolers of this type require only small foundations under the headers (see Fig. 4, which also shows the right way of connecting the cooler to a circuit). The cooler in Fig. 4 consists of three units with six pipes each, so that water and liquid have to pass eighteen times forward and backward through the cooler from entrance to outlet. The cooling water is delivered through the vertical pipe in front at the right and passes through a regulating valve into the bottom pipe, which consists of four T-pieces and three three-way cocks. The small valve at the end serves to drain the water from the cooler when emptying it. The water enters the bottom pipe of the first unit, travels forward and backward through the other pipes and leaves by the vertical downcomer to enter the next unit and so on until it runs from the last unit to waste or to a sump. The water outlet of each unit is provided with a stop cock so that each of the three units can be disconnected for cleaning or repairing without interrupting the flow of the water or the liquid.

The liquid, in this particular instance consisting of oil, enters by the horizontal pipe at the left on top of the left cooler-unit by a three-way cock on top of the header. The liquid flows in a counter-current through the cooling pipes and leaves at the bottom by a bend, being connected by a vertical pipe between the headers of the units to the upper distributing pipe, which is built of two tees and four three-way cocks. The liquid as well as the water outlets of each cooling unit are provided with thermometers so that the operation of each unit can be closely controlled.

The advantage of these coolers rests in their high efficiency and the possibility of cutting out a unit without disturbing the flow of the liquid. Where the consumption of cooling water is of little importance, the cooling efficiency can be considerably increased by providing each unit of the cooler with a fresh water inlet and a separate outlet. A disadvantage of the design is that when fairly long pipes are used the tubes have a tendency to sag slightly in the middle, touch one another and obstruct regular flow. The same effect may be produced by the expansion of the tubes increasing their length so that they must bend in the middle. Depending upon the nature of the liquid, solids have an inclination to deposit and gradually obstruct the passage. With liquids containing solids or salts in solution, it is a wise precaution not to have very long cooling pipes and to use only water tubes which are perfectly straight. Naturally, by reducing the length of the pipes more units must be added to provide a given cooling surface, making the cooler comparatively more expensive.

In a certain sense this cooler is a modification of that first mentioned, in that an air-cooling effect is also obtained. This latter effect is, however, very small, and except in very cold weather hardly noticeable. Spraying the cooling pipes with water from the outside has been tried, but the additional cooling effect thus gained is scarcely large enough to justify the additional expense. If such an apparatus is used as a cooler and heater at the same time (a so-called heat exchanger), the cooling pipes may be insulated to reduce the heat loss from radiation. Coolers of this type are in common use for a great number of different purposes in many chemical plants on the European continent.

Box Coolers

A similar design has also been developed, differing from the foregoing only in that instead of the outer pipes each two headers of a cooling unit are connected by means of a box of steel plates. Such a cooler is reproduced in Fig. 5 in section parallel to the cooling tubes. Both side plates are bolted to the bottom plate and the cover by means of heavy angle irons riveted to the plates. The box so formed is open on both ends and receives the end plates, which are provided with rows of machined holes that receive the ends of the cooling tubes *d*. One end of the cooling tubes is provided with a rigid collar, slightly tapered and machined, and on the opposite end the tubes are resting in tightly packed glands so as to allow for movement by expansion or contraction through changes of temperature. In the middle of the box a long bolt reaches across under each row of tubes, supporting them so that by expansion they are forced to move in their glands on the end, but cannot bend downward even if of considerable length.

As a rule three cooling tubes are placed in one horizontal row; in some instances only two. The openings formed by the end plates of the headers are closed by cast-iron channel pieces bolted to them and acting like U-bends so that each row of pipes, commencing at the bottom, is thus connected to the next one above. By this means a definite path for the cooling water is prescribed in order to attain the maximum efficiency. To assure a similarly long path for the liquid occupying the room inside the box but outside the water tubes, and to prevent the formation of any dead spaces in the cooler, baffle plates are arranged exactly in the middle between

each two rows of tubes and tightly riveted to both sides of the box, assuring at the same time rigidity for the whole unit. The baffles reach alternatively to one end, varying with each row. Above the bottom row of cooling tubes in Fig. 4 the baffle fits snugly at the left end, while on the opposite end it is sufficiently distant from the end plate to allow ample clearance for the circulating liquid to pass upward. The next baffle above is fixed tightly to the header at the right. Thus the liquid is forced along the cooling tubes through which water travels in the opposite direction.

The water enters the cooler by the connection *h*, travels through each row of cooling tubes in succession and leaves by the outlet *g*. The liquid to be cooled enters by the branch *k*, in the lid of the box, and leaves by the outlet *i*, in the bottom. To facilitate a cleaning of the cooling tubes the end covers have, in line with the tubes, threaded holes, closed by removable screw plugs. The units are connected so that one may be bypassed for cleaning or repairing without having to interrupt the circuit of the liquid.

Comparison of Coolers

The box cooler shares with the multitubular cooler the same advantages without possessing the disadvantages of the latter. Both are constructed in lengths of 30 to 35 ft., but in the box type cooling tubes of larger diameter which are kept clean easier can be used. The tubes are easily removed and exchanged, since they are not expanded into the header plates.

Compared with the coil cooler, where leaks are plainly visible, the multitubular and boxtype coolers share with all other designs of water-tube coolers the disadvantages that leaks are not easily detected and may be a source of severe losses before noticed if proper precautions are not taken. For the operating control of such coolers, the temperatures indicated by the different thermometers must be recorded at fixed intervals unless recording thermometers are used. The comparison of these temperatures offers a good base to judge the efficiency, which decreases gradually down to a point where it becomes necessary to clean the cooler. The temperature records are not noticeably affected by internal leaks or the defects must be so great that they could be noted without referring to the temperatures.

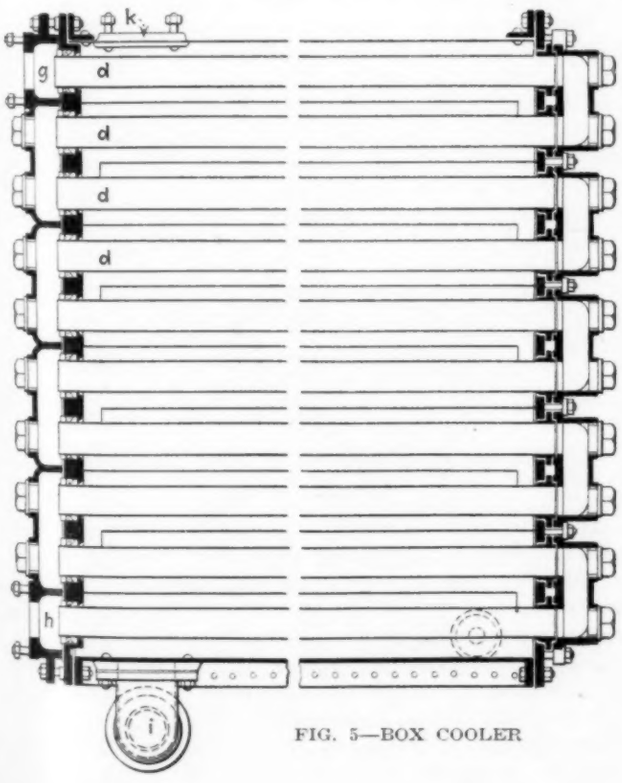


FIG. 5—BOX COOLER

Where liquids are cooled which mix readily with the water without changing its appearance, it is imperative to make a daily test either of the cooling water or of the liquid passing the cooler to ascertain whether there is any pollution. The effect of a leak depends upon local conditions. Where the pressure of the cooling water is higher than that of the liquid, the water will enter the liquid, or *vice versa*. In case of cooling oil, water in the oil is noticeable or an opaque skin on top of the cooling water will disclose the fact of an internal leak. In a cooler of this kind serving to cool ammonia liquor, a leak was suspected and the writer dissolved a quantity of about 1 oz. of fluorescine in the ammonia liquor circuit. This aniline dye has a tremendous tinctorial power and can plainly be noticed even in infinitesimal dilution.

Direct-Acting Coolers

In cases where liquids are to be cooled which do not mix with water readily and can be separated again owing to their greater or smaller specific gravity, direct-acting coolers have been successfully introduced in recent years. The fact that oil can be cooled by bringing it in direct contact with water has already been mentioned in these columns by Kuhn (*Chem. & Met.*, 1922, vol. 26, No. 1, p. 32) without going into details of the construction, which will be seen from Fig. 6, showing such a cooler in longitudinal section. If the box cooler, Fig. 5, is deprived of its cooling tubes, so that only its baffle plates remain, the construction then practically corresponds with a direct-acting cooler and, as a matter of fact, such coolers have in a few instances been remodeled on these lines. Such a course is not to be recommended owing to the box cooler being rather too narrow for the purpose.

The direct cooler consists of a plate box riveted together, about 25 to 30 ft. long, 39 to 78 in. wide and about 11 ft. 6 in. high, without considering the sump. Inside the box a number of horizontal spouts are riveted tightly to the sides, arranged similarly to the baffle plates in the box cooler. The spouts are of the same width as the cooler. Where an oil is to be cooled of heavier specific gravity than the cooling water, the latter is introduced at the bottom by means of the pipe entrance, making its way upward in zigzag fashion over the spouts (according to the dotted arrows in Fig. 6). From the top spout the water enters the upper part of the cooler, where it is cleared and freed from any oil particles held in suspension by passing it around the vertical baffle plates, leaving the cooler by the connection *e*. The hot oil enters the cooler at *f*, to be delivered to the distributing chamber *g*. In this chamber the oil is mixed with the water in a finely divided condition and on account of its higher specific gravity it sinks to the bottom after cooling in the top compartments and flows in opposite direction to the cooling water in a zigzag way according to the full-line arrows through the cooler. To the bottom of the cooler is connected on one end the oil sump, which is about 10 ft. deep. This sump serves as a collecting chamber for the oil and allows it to come to rest and separate from any water which may

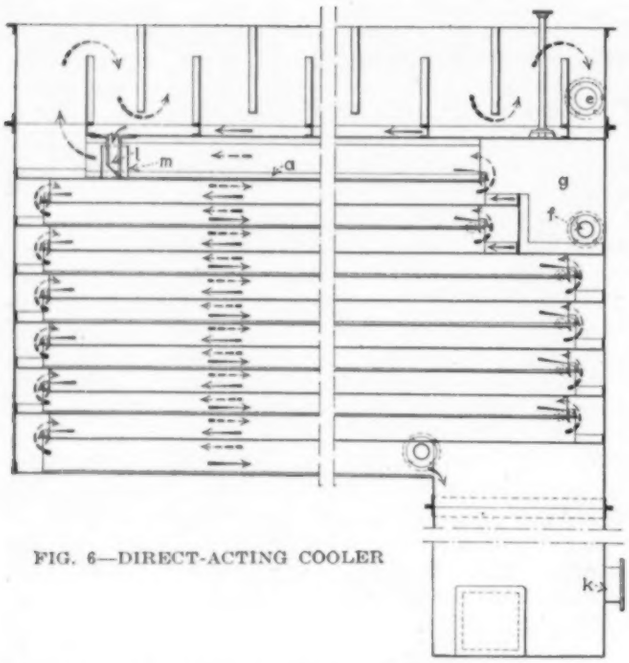


FIG. 6—DIRECT-ACTING COOLER

have been kept in suspension. The water-free oil is drawn off by the pump connection *k*. The oil separated from the cooling water behind the vertical baffles in the upper part of the cooler runs through the overflow *l* with seal *m* back to the bottom of the top spout *a*, where it joins the downward-running oil stream so that no oil is lost with the cooling water.

By introducing this type of cooler, which is particularly adapted for cooling absorbing oil in benzene recovery plants, the cooling surface provided is so large that two separate units suffice amply to deal with the regular quantities. Means must be provided for cutting out one unit for cleaning without seriously impairing the operation of the plant.

Compared with the tubular coolers, the direct acting offer the advantage of comparatively small initial cost and hardly any upkeep, since there is nothing to wear or get out of order. The deposit which gradually settles upon the spouts and reduces the cooling efficiency by checking the heat transmission through the spout bottoms can be removed within a very short time by corresponding holes provided on both ends of the box at the height of the spouts and closed by removable lids.

The disadvantage of these coolers rests in the fact that their operation depends in a marked degree upon the condition of the oil regardless of whether an oil with higher or lower specific gravity than water is treated. As long as the oil is fairly clean, there is no difficulty in keeping the outflowing water free from oil and the cooled oil free from water. It is well known that the tendency of oily substances like tar and oils to form an emulsion with water is not so much dependent upon their respective specific gravity, but is greatly affected by the amount of solids held in suspension. For this reason the operation of such coolers gradually becomes more difficult the dirtier the oil becomes. Some kinds of oil cannot be treated at all by these coolers.

To use such a cooler for oils with a specific gravity lower than water, the design is slightly altered to allow the hot oil to be introduced at the bottom and the cooled oil to be drawn off on the top, while the water is circulated in the opposite direction.

The direct-acting cooler type was first tried about 12 years ago, but did not at first prove a success. After the conclusion of the war the cooler was introduced again, this time under the compulsion of lack of material to replace defective cooler tubes. The proper working methods and conditions were soon recognized and since then a great many such coolers have been erected, in most places with marked success, though in some instances they had to be discarded again owing to the impossibility of obtaining a perfect separation.

Detection of Sulphur in Oil and How to Remove It

Some Mexican crude petroleums run as high as 5 per cent sulphur, but in the crudes produced in this country the sulphur content is rarely greater than 1 per cent, and in the majority of crudes is below five-tenths of 1 per cent, according to D. B. Dow, assistant organic chemist, Bureau of Mines. This sulphur may be present as dissolved sulphur, colloidal sulphur, hydrogen sulphide, or sulphur deviations of hydrocarbons. The study of these forms of sulphur is very complex, and unfortunately little information covering the chemistry of sulphur in petroleum is available. In *Chem. & Met.*, April 9, 1923, Egloff and Morrell discussed the distribution of sulphur in petroleum, with particular reference to products resulting from cracking distillation.

In the distillation of crude oil, either in the refinery or laboratory, sulphur generally is present in all the distillates, as well as in the residuum. Its occurrence in natural gas is quite common and consequently it is often found in gasolines derived from natural gas. Sulphur compounds have various objectionable characteristics. Distillates from certain crudes, such as those from Lima, Ohio, and Petrolia, Canada, have extremely bad odors and cannot be used until desulphurized. Mexican crudes and distillates often contain notable quantities of hydrogen sulphide. As this is a toxic gas, it has been the cause of many cases of poisoning.

The use of oils containing elementary sulphur or hydrogen sulphide is objectionable with certain metals, such as copper, because of the corrosive action of such oils on these metals. Gasoline discolored by sulphur compounds often becomes quite yellow and may have the appearance of an inferior motor fuel containing components of low gravity and high end point. This appearance, of course, detracts from the price, even though the gasoline may be satisfactory in use.

Information regarding the detection of sulphur in natural gas gasoline and the treatment for the removal of certain sulphur compounds is given in Serial 2462, which may be obtained from the Department of the Interior, Bureau of Mines, Washington, D. C.

Bureau of Standards to Serve Leather Manufacturers

The Bureau of Standards has completed arrangements with one of the large leather companies whereby certain samples of sole leather will be furnished every 2 weeks for a period of six months. Water absorption, water penetration, density and abrasion tests will be made on these samples together with chemical analyses to determine the degree of uniformity to be expected in this product over a given period of time and also to determine the suitability of the abrasion apparatus for routine, commercial, and specification testing work.

Carbon Dioxide in Industry

Some Technically Important Uses of This Well-Known Gas Which the Census Reports as Second Only to Sulphuric Acid Among the Acids in Value of Annual Output

By Charles L. Jones*

FEW realize the significant rôle of liquefied carbon dioxide in the technical industries or the wide range of its possible applications in uses where the liquefied gas is not ordinarily met. In more instances than one transportability, permanence or temporary nature of gas requirements, convenience, immediate availability, pressure required and purity may suggest the use of commercial liquefied carbon dioxide where low-pressure gases might theoretically be used.

It is difficult, if not impossible, to give accurate figures showing the relative amounts of liquefied carbon dioxide used for various purposes, but about 90 per cent of the total production goes into the preparation of carbonated beverages, the remaining 10 per cent being divided among other uses. It is of interest to note that among the acids, with which "carbonic acid gas" is listed by the Bureau of the Census, carbon dioxide is second only to sulphuric acid in annual value of product.

The manufacture of carbon dioxide by the usual process has recently been described in the literature [see *Chem. & Met.*, vol. 23 (1920), pp. 346-7 and vol. 28 (1923), p. 5] and will not be discussed here. The accompanying chart of uses of carbon dioxide has been prepared to show especially the present-day uses of the liquefied gas (indicated by heavy lines), but it also indicates many applications for which liquefied carbon dioxide is not commonly used.

In the Food-Products Industries

On account of its purity, its non-oxidizing quality, its inhibitive action on certain bacteria and its ability to stimulate taste sensation, carbon dioxide has found application in various ways in the food-products industries, its principal outlet being, of course, in carbonated beverages.

While the primary reason for carbonating beverages is to give the public what it wants by improving the taste and appearance of certain beverages, carbon dioxide exercises other functions no less important. It accentuates flavors and has a certain psychological refrigerant effect. Although not sold primarily on the basis of bactericidal action, the bacterial count is steadily reduced in a carbonated beverage on standing, the amount of reduction depending upon various factors. It is not a panacea for insanitary methods of manufacture, but it may be safely asserted that, *ceteris paribus*, carbonation will produce a more nearly sterile beverage.

Among the other interesting outlets of carbon dioxide in the food-products industries may be mentioned the canning of certain products in carbon dioxide. Used in this way, various troubles due to oxidation are avoided, flavor is conserved and a weaker container may be used than is necessary for vacuum packing. Shredded coconut and walnuts packed in carbon dioxide are now on the market. Carbon dioxide has also been proposed as an atmosphere for the protection of fruits in shipment, and a number of agencies are according research attention to unrefrigerated and partly refrigerated storage of grapes, apples and other fruits in carbon-dioxide atmospheres.

Bread directly leavened by mixing flour with carbonated water was formerly sold in England, but is no longer on the market. In the dairy and ice cream industries, carbon dioxide has found wide application. Where air is excluded in the churning of butter and carbon dioxide is substituted therefor, oxidation of the butter by occluded gases is impossible, and the time of becoming rancid is said to be considerably delayed. A wider use is in the manufacture of ice cream, where the substitution of carbon dioxide for air in the freezer results in the production of a cream that is mechanically stronger and slightly lighter. Vitamins are conserved, the product is cleaner in so far as the carbon dioxide excludes the dust of the room, and some bactericidal action is said to be exerted.

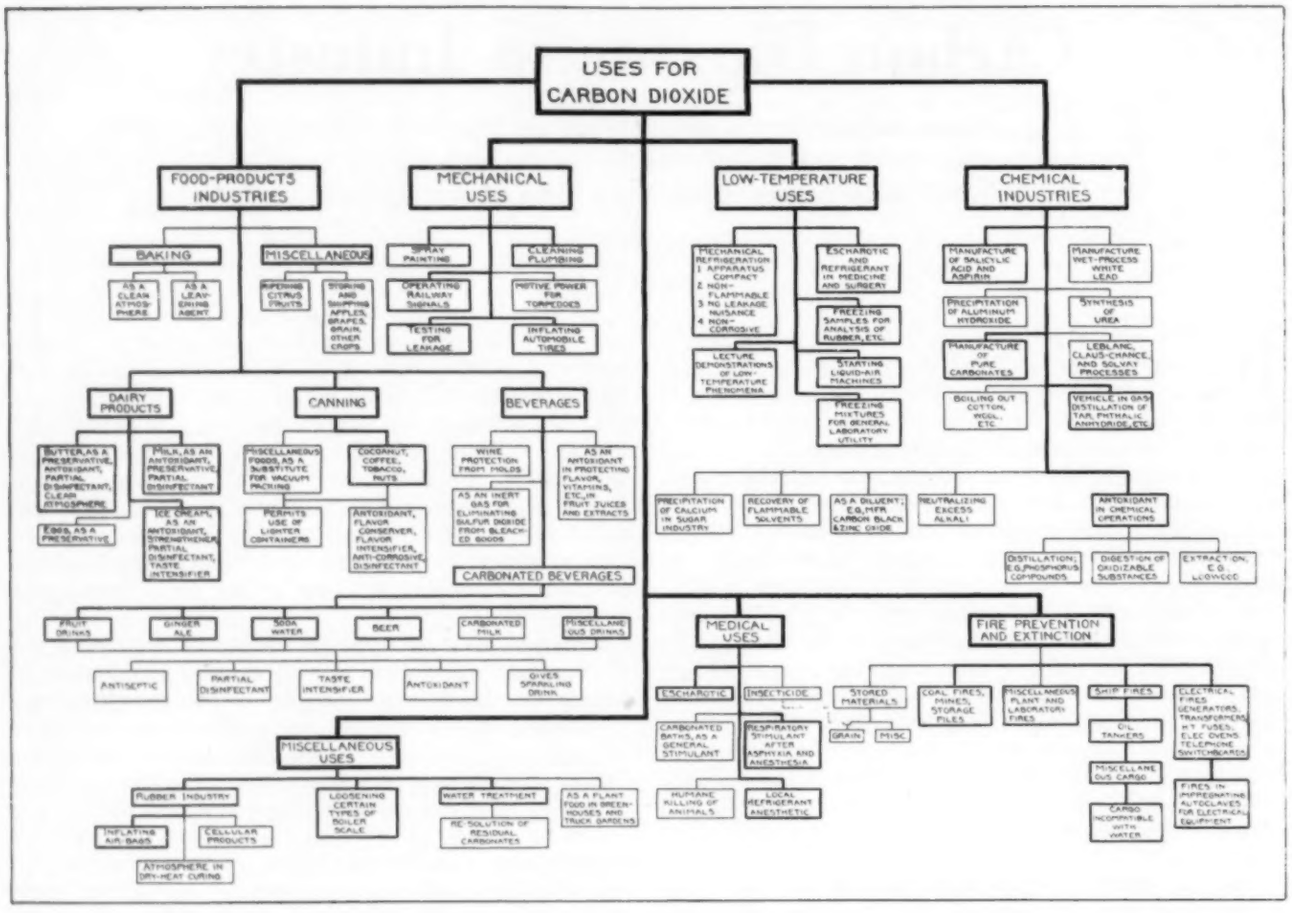
A number of processes have been proposed for the preservation of milk and eggs by means of carbon dioxide, but none of these has yet received trial on a scale sufficient to define its commercial possibilities. As an inert gas, it has been proposed for eliminating residual sulphur dioxide from bleached liquids.

Producing Low Temperatures

Carbon dioxide enters in various ways into the production of low temperatures, its principal application being as a refrigerant in mechanical refrigeration. Its outstanding advantage for this purpose is the safety from fire, explosion and disagreeable physiological effects, and it is hence much used in congested localities and on shipboard. The carbon dioxide machine is economical of space and possesses many other advantages that outweigh its slightly higher power consumption in certain instances.

In the laboratory, carbon dioxide snow may be used for obtaining low temperatures. Mixed with ethyl alcohol, ether or other organic solvents, it is a useful cooling medium in the laboratory for traps, condensers, etc. In chemical analysis it is useful in freezing such materials as rubber into a brittle condition in which they can be pulverized. In histology it is used in freezing specimens for the cutting of microtome sections. It is used in starting other low-temperature apparatus, such as liquid-air machines, and for the demonstration of various low-temperature phenomena.

*Industrial Fellow, Mellon Institute of Industrial Research, University of Pittsburgh; Research Chemist for the Carbon Dioxide Division, Compressed Gas Manufacturers' Association.



In the Chemical Industries

Most of the uses in the chemical industries shown on the chart make use of flue or kiln gases for their supply of carbon dioxide, and the liquefied gas is used generally for applications requiring smaller quantities. The liquefied gas is used as a source of inert gas for handling easily oxidizable materials, such as phosphorus compounds, and for the gas distillation and protection from oxidation of some organic compounds. It is also used in the manufacture of salicylic acid and in the preparation of pure carbonates. The synthetic preparation of urea involves the use of pure carbon dioxide at high pressures and affords interesting possibilities.

A Source of Pressure—It is worthy of note that a carbon dioxide cylinder is the cheapest available decentralized source of pressures over 500 lb. per sq.in. This is the basis of many interesting uses, such as testing for leakage in lead cable covers, blowing obstructions from plumbing, operating outlying railway signals, and inflating automobile tires. It is now used for operating isolated paint spray-nozzles, where the absence of fire risk is a desirable feature.

Fire Extinction and Prevention

Carbon dioxide has been applied successfully to many kinds of fires. It extinguishes flame by keeping oxygen from combustible material or by narrowing the explosive limits of combustible gases. One branch of the Bell system uses carbon dioxide for fire extinction in telephone exchanges. It has recently been applied to fire extinguishers for central station turbo-generators. Its use as a fire extinction agent on shipboard has been practiced for some years, and many vessels are equipped with gas extinguishers. It has been successfully applied to coal-pile fires, and has recently been used for the extinction of a large mine fire. A large petroleum company has tank ships protected with automatic appliances for carbon dioxide fire extinction.

Medical and Other Uses

Functionally, carbon dioxide acts as a mild irritant and stimulant, has a direct specific action on the nerve center controlling respiration, acts as a refrigerant in the form of carbon dioxide snow, and in very high concentrations produces various effects due principally to the cutting off of the oxygen supply. It should be emphasized that carbon dioxide is not poisonous, and atmospheres containing up to 5 per cent cause no serious impairment of normal activity, while with very much higher percentages distress is purely temporary and results in no permanent ill effects. Carbon dioxide snow is not used as much as formerly as an escharotic and cauterant, and for local refrigeration anesthesia, but is still employed effectively in some cases. In the form of carbonated baths, carbon dioxide has been widely used, especially at the celebrated Nauheim baths. The fact that, internally, carbonated waters may produce mild catharsis is well known.

The use of carbon dioxide as a respiratory stimulant has resulted in great advances in the treatment of carbon monoxide asphyxia, and this use is one of a number that are of far greater public importance than the tonnage involved would indicate.

Carbon dioxide is applied in the rubber industry for filling the air-bags which support tires during vulcanization, and has resulted in many cases in great in-

creases in the life of the air-bags over results obtained with air inflation. It has also been used as a non-oxidizing atmosphere in ovens for vulcanizing mechanical rubber goods.

A number of interesting uses depend upon the ability of carbonated waters to dissolve calcium carbonate, and this reaction has been made the basis of cleaning deposits from piping, removing boiler scale, improving the manufacture of raw water ice, and even the treatment of the entire water supply in certain cities.

An extremely interesting recent European development is the introduction of carbon dioxide into the air in greenhouses and even in open fields for the stimulation of plant growth. Small increases in carbon dioxide concentration in the air seem to produce remarkable effects on growing plants, so that important commercial results have been obtained in the growing of certain flowers, and great economy of greenhouse space for products grown under glass is indicated. The process is now being introduced into this country.

EDITOR'S NOTE—*In the limited space available in the present issue it has been impossible for Dr. Jones more than to catalogue a few of the chief uses of CO_2. Extended study has been made of many of these uses in the author's laboratory in Mellon Institute, at Pittsburgh, and it is suggested that readers desiring additional information communicate with him.*

Synthetic Ammonia From Coke-Oven Gas

Claude's Developments in This Field Described in French Letter—Ceramics Congress Held and Standards Company Formed

FROM OUR PARIS CORRESPONDENT

APPARENTLY the efforts of M. Claude for applying his method of ammonia synthesis to the treating of coke-oven gases have met with success. There follows a description of the results so far obtained.

First of all, Claude has succeeded in obtaining hydrogen as a residuum from the dissolution, under pressure, of coke-oven gas in an appropriate solvent, which was actually ordinary ether. It was near the end of 1921, when Claude, at the Montereau Works, succeeded in making a very simple apparatus producing 230 cu.m. of hydrogen hourly from 500 cu.m. of water gas. He succeeded in using this hydrogen immediately in his production of ammonia. This first apparatus has now been replaced by one having twice that capacity and the present apparatus is supplying a plant producing 5 metric tons of ammonia daily. The treatment of water gas was but an intermediate step toward the treatment of coke-oven gas.

Notwithstanding the small quantity of coke-oven gas heated (850 cu.m. per hour), the working pressure of the Béthune collieries apparatus is somewhat under 24 atmospheres. It is hoped that a pressure of below 15 atmospheres may be obtained with a new type of apparatus now being studied, which is designed to treat 5,000 cu.m. of gas per hour, equivalent to a daily production of 20 metric tons of ammonia.

At Béthune the gases treated are compressed on coming from the debenzolizing appliances, to a pressure of approximately 25 atmospheres. The succeeding apparatus for treatment consists of a series of towers. In the first the gas comes in contact with a flow of heavy oil controlled by a small pump. Here any remnants of benzol still carried by the gas are scrubbed out. Thence the gases run into a second column, where they are decarbonated by means of a flow of lime water delivered by a centrifugal pump. The next stage in the process carries them to separators, where the water is taken out as well as any other condensable products. Ethylene, one of the most precious of these, can be recovered separately. The hydrogen taken out is then sent on to a gasometer, and the other gases carrying high methane contents are sent back to the works for utilization. So low is the cost price of the hydrogen obtained as above described that it is possible to use the nitrogen produced in any one of the usual processes in common practice.

Below are given certain of the results obtained at the Béthune collieries. When 850 cu.m. of gas were treated per hour, the amount of hydrogen obtained was approximately 425 cu.m. per hour, or 50 per cent. This analyzed about 90 per cent pure hydrogen, 1.6 per cent carbon monoxide, and a remainder of approximately 9.4 per cent of nitrogen. Ammonia was produced at the rate of 150 kg. per hour, of which 140 kg. was in the liquid state. The amount of power required for this operation, including the heating of the tubes, debenzolizing and decarbonization, was approximately 460 kw. The physico-chemical method of decarbonization is to be replaced by a purely chemical method that will permit the reduction of power consumed in the apparatus as it is used at present.

Claude claims for his process great simplicity, as well as very low erection and labor costs. The fact that the gases are compressed for the purpose of recovering the hydrogen from them may be of advantage in carrying out the whole process of debenzolizing under pressure. The yield in benzol would then be increased by 10 to 15 per cent, while the size of the absorption and distillation appliances would be reduced. Naturally, the amount of solvents or scrubbing oil and the unavoidable losses and the consumption of steam, etc., would also diminish.

As the various component parts of the gases are recovered and can be used separately, it is very likely that from 150 to 200 kg. of ethyl alcohol will be produced per metric ton of ammonia. The increase of the yield of benzol and the production of ethylene are alone sufficient to make up for the cost of compressing the gases in view of the hydrogen separation.

A company has recently been organized of eminent chemists and metallurgical and electrometallurgical concerns, with a capital of 50,000 francs, under the name of Société des Échantillons-Types (standards) pour Analyses. The object in the formation of the new company is for the elaboration of samples of technologic products intended to be used as standards for chemical analyses.

At the technical congress for ceramic arts held in Paris late in May, M. Bigot, an engineer who has specialized in ceramic arts, made a communication relative to the plasticity of ceramic products, after a thorough study of that question.

M. Bigot distinguishes the four following kinds of plasticity as applying to ceramic raw stuffs, kaolins and clays: 1, Colloidal plasticity, which is a most important factor, often ignored, in all ceramic trades; 2, lamellar plasticity; 3, plasticity obtained through adjunction of colloidal organic matters; 4, plasticity obtained through mixing fine fibrous matters with the paste of clay or kaolin.

Obtaining Uniform Strength in Chill-Cast Rods of "Y" Alloy*

Melting This Aluminum-Copper-Nickel-Magnesium Alloy at 800 Deg. C. and Pouring Very Slowly at 750 Deg. C. in Properly Designed Chills Will Produce Castings Which When Heat-Treated Have Tensile Strength of 45,000 Lb. and 5½ Per Cent Reduction

By W. Rosenhain, S. L. Archbutt and S. A. E. Wells
National Physical Laboratory

HEAT-TREATED chill-cast rods of the "Y"[1] alloy have been found, from time to time, to give tensile tests showing an ultimate stress of 21 tons per sq.in., combined with an elongation of 5 to 6 per cent on 2 in. While these tests indicated the remarkable capacity of this alloy to attain great strength after heat-treatment, their value for practical purposes was considerably reduced by the fact that such results could not be obtained with complete regularity. Without any marked difference either in the composition of the alloy or the method of casting or heat-treatment, results as low as 13.3 tons per sq.in. for ultimate tensile strength were obtained, so that the higher degree of strength could not be relied upon with regularity or certainty. It therefore appeared desirable to investigate the causes of this variability more closely. The endeavor to eliminate this irregularity has led the authors to make a detailed study of the process of chill-casting so far as rods 1 in. in diameter are concerned. The results obtained are regarded as very satisfactory, since it is now possible to prepare chill-cast rods of this alloy which regularly give values of tensile strength exceeding 20 tons per sq.in. Not only has the result proved satisfactory in regard to this particular alloy but it has thrown very considerable light upon the factors that influence the properties from the strength point of view of chill-castings and die-castings in general.

Discoloration in Fractures

The first step in the present investigation was the careful examination of fractured tensile test-pieces of heat-treated "Y" alloy which had given unsatisfactory results. On a number of these slightly discolored spots were visible on the fracture. Spots of this kind were invariably present in test-pieces which had given low results. By breaking a number of bars in the "as cast" condition, it was soon found that fractures thus obtained were uniformly clean and bright, so that the discoloration was evidently not present prior to heat-treatment. It was therefore thought that possibly the discoloration might arise from cracks which had been produced during heat-treatment, either by unduly rapid heating when the bars were plunged into the bath of molten nitrates, or by unduly severe chilling during the subsequent quenching. To test this point some bars were slowly heated from room temperature in an electric muffle furnace, and transferred to the salt bath for completion of the heat-treatment only when their temperature had reached that of the bath. Another batch of bars was left in the electric muffle furnace itself and heat-treatment completed there. Both sets of bars showed discolored patches on the fractures, accompanying low test results.

It was next thought that possibly electrolytic action might occur in the salt bath in a manner which is known to take place in the heat-treatment of certain other alloys. In order to avoid this, the bars were held in a cage of wires made of the same material as the bars themselves ("Y" alloy), thus preventing the formation of any galvanic couple with the fused salt as electrolyte. The defects were, however, still found when the bars were broken.

Time When Defects Formed

Did the cracks occur during quenching? A series of bars were heat-treated in the normal way, but instead of quenching from the salt bath were transferred to an electric muffle furnace standing at the same temperature, which was then allowed to cool to room temperature in about 16 hours. Further batches of bars were heat-treated in the salt bath and quenched, employing less drastic media, such as fish oil at room temperature, fish oil raised to 150 deg. C., and cooling in a jet of compressed air. The last process of cooling occupied approximately 10 minutes.

It was found that low tensile results and discolored fractures occurred with all these treatments. It may therefore be concluded that merely heating the bars, in whatever manner, is sufficient to produce discolored patches upon the fractures. If these patches are due to cracks or cavities in the metal, it follows that such cracks or cavities must exist in the bars when first cast, and that they are not produced by subsequent treatment.

This conclusion can be further tested by ascertaining whether an oxidizing atmosphere is necessary to bring about the discoloration. For this purpose bars were heat-treated in an atmosphere of hydrogen and nitrogen respectively; perfectly clean bright fractures were obtained. Examination with a binocular microscope, however, showed that small cavities were present, having the characteristic feature of casting unsoundness—viz., the projection of minute dendritic crystals into the cavities. In these bars, although the discoloration of the fracture had been avoided by the absence of an oxidizing atmosphere during heating, the unsoundness had not been removed, and low tensile results were still obtained. The conclusion is therefore confirmed that the discolored patches observed on the fractures of bars as ordinarily heat-treated are due to the penetration of oxidizing gases through the metal into cavities, or unsoundness existing in the cast bar.

A ready means of detecting unsoundness in chill-cast bars of the kind under examination is by determining the density. This was rendered particularly desirable be-

*A paper read before the British Institute of Metals, March 7, 1923 (slightly condensed).

[1]The "Y" alloy contains copper 4 per cent, nickel 2 per cent, magnesium 1.5 per cent, aluminum 92.5 per cent. See "Eleventh Report to the Alloys Research Committee of the Institution of Mechanical Engineers, 1921," *Chem. & Met.*, April 26, 1922, vol. 26, p. 785.

cause the surface appearance of the bars after machining into the form of test-pieces gave no indication whatever of unsoundness. It was found that when pieces were turned down in the lathe, the apparent density of the whole piece diminished with the removal of successive layers. This result indicated that the unsoundness was located at or near the center of the cast bar. In order, therefore, to make the density determination a better guide to the tensile strength which might be expected, the determinations were subsequently carried out on standard tension test-pieces. The correlation between density determined in this way and tensile strength is very close.

Formation of Unsound Core

Experience obtained in casting bars and billets in chill molds from other alloys indicated that the probable cause of unsoundness at the center lies in the formation of an unduly deep ring of radial or "chill" crystals starting from the surface of contact with the mold. Previous experience in the casting of slabs for rolling purposes serves to show that where a deep layer of chill crystals is formed there is a strong tendency for the slabs to split down the middle, while such a tendency can be avoided by diminishing the depth of this chill. The manner in which the formation of an undue depth of chill crystals could be avoided was therefore studied, and it appeared at once that the governing factor is the amount of chill which is given to the metal in immediate contact with the mold. This in turn must depend upon the heat capacity of the mold, and will be governed both by the temperature of the mold and by its mass, specific heat and thermal conductivity. With a given material of mold, and a temperature fixed by other considerations, the depth of chill can be influenced only by the cross-sectional area of the mold, and attention has therefore been given to determining the best ratio of cross-sectional area of mold to casting.[1]

When a heavy cast-iron mold is used, while the outer layer of metal in contact with the mold is rapidly chilled and solidified, the rate of solidification of the liquid metal in the center of the casting is much slower, and this shows itself by excessive "piping." Even when the rate of pouring is so controlled that a minimum amount of molten metal is at any time in the mold, this cannot entirely overcome the effect of the excessive chilling of the outer surface. Although a certain amount of improvement can be effected by the subsequent addition of molten metal during solidification ("following up"), it is not possible by this means entirely to prevent the formation of contraction cavities. A certain amount of improvement can also be effected by increasing the temperature of the mold, and this is particularly effective in the case of aluminum alloys, when the temperature of the mold can, if necessary, be raised nearly to that of the freezing point of the alloy. Too high a mold temperature, on the other hand, brings with it disadvantages nearly as serious as those resulting from an unduly low temperature. The mold temperature, therefore, becomes fixed by a consideration of the quality of the surface produced on the casting, and the regulation of the amount of chilling can best be effected by varying the mass of the mold itself.

[1]Considerable attention has been given to the question of the effect of the mass of mold and the formation of radial crystals in steel ingots. — J. E. Fletcher, *Journal of the Iron and Steel Institute*, No. 2, 1918, vol. 98, p. 231.

The cast-iron molds which were generally used in the laboratory for the production of chill-cast bars 1 in. in diameter have a cross-sectional area of approximately seven times that of the chill-cast bar. A series of melts was made and sectioned to discover the effect of temperature of such a mold on the resulting macrostructure. The effects obtained show a core whose visible porosity diminishes with rising mold temperature up to 350 deg. C.; with higher mold temperature the general retardation of cooling becomes too great, resulting in a coarse structure, which is generally accompanied by widely distributed minute unsoundness.

With a mold temperature of 350 deg. C., a pouring temperature of 750 deg. C. was found to give the best result. At lower pouring temperatures cold shutting developed, and above 750 deg. C. bars having a coarser grain were produced.

It will be seen from the above remarks that with comparatively heavy iron molds the power controlling the depth of chill is very limited, and there is the further disadvantage that a comparatively slight change in the method of manipulation makes very considerable difference to the result, so that the permissible variations in the working process are too small to be readily observed in practice. The aim has accordingly been kept in view by the authors to provide, if possible, a method of producing sound castings which should be easy of application, and this implies a reasonably wide latitude in regard to the various operating details.

New Molds

In order to obtain a diminished chilling effect, two lighter molds were tried, having cross-sectional areas respectively three times and twice that of the cast bars (wall thicknesses of ½ in. and ¼ in.). Batches of bars were cast in them, varying the mold temperature and casting temperature in order to determine the best condition for each type of mold. It was found that for the mold having a ratio of area of 3:1 the best temperature was 150 to 200 deg. C., with a casting temperature of 750 deg. C.; used in this way molds of this type gave excellent bars. Density determinations carried out on bars rough machined to the shape of a test-piece are given in Table I, correlated in a number of instances with tensile tests after heat-treatment.

In the test listed in Table I, all the alloys were poured at 750 deg. C. The first three bars represent the average results on heavy molds, while the next two show some high-strength sound bars obtained at times. Note

TABLE I—EFFECT OF SIZE OF MOLD

Melt No., etc., of Bar	Magnesium	Analysis, Per Cent Nickel	Copper	Mold Temp., Deg. C.	Corrected Density, Grams Per c.c. Roughed-out Test-piece	Ultimate Stress, Lb. Per Sq.In.
			7 : 1 Mold			
1688 (2)	1.49	2.03	4.04	350	2.754	.....
1630 (17)	1.64	1.99	4.05	350	2.756	37,000
1666 (15)	1.64	1.99	4.05	350	2.754	29,800
1630 (11)	1.64	1.99	4.05	350	2.794	48,400
1564 ..	1.48	1.90	3.90	350	2.784	47,000
			3 : 1 Mold			
1712 (4)	1.55	2.10	4.01	200	2.788	44,400
1706 (6)	1.45	1.95	3.84	200	2.790	52,500
1784 (5)	1.48	2.04	4.00	150	2.792	47,800
1784 (6)	1.48	2.04	4.00	140	2.792	49,000
1786 (5)	1.50	2.01	4.08	155	2.792	47,800
1787 (10)	1.54	1.99	3.91	145	2.793	46,600
			2 : 1 Mold			
1750 (1)	1.60	1.98	3.99	150	2.786	.....
1750 (2)	1.60	1.98	3.99	150	2.782	.....
1750 (5)	1.60	1.98	3.99	150	2.786	.....
1750 (6)	1.60	1.98	3.99	150	2.790	.....
1750 (9)	1.60	1.98	3.99	150	2.790	.....
1750 (10)	1.60	1.98	3.99	150	2.787	.....

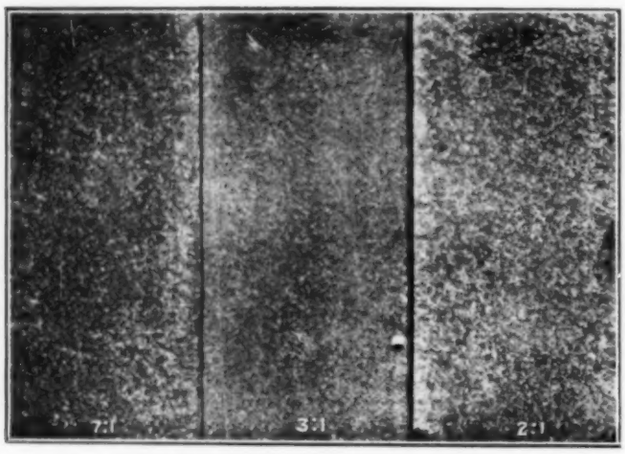


FIG. 1—GRAIN SIZE AS AFFECTED BY THICKNESS OF IRON MOLD. × 1.

their high specific gravity. Chill castings from the 3:1 mold have the same density whether tested as cast or machined to size. Thus there is no appreciable unsoundness at the center.

The attainment of a uniformly high density throughout the cross-section of the rods is seen to be correlated with a uniformly high value of the ultimate stress under tensile test. So close is this correlation between a density of approximately 2.79 and a tensile strength exceeding 20 tons per sq.m. that in further cases the density determination alone has been relied upon.

In order to illustrate the effect of varying mold cross-section upon the macrostructure of the resulting casting, portions of vertical sections of three typical cast bars are shown in Fig. 1. It will be seen that the mold having the 3:1 ratio gives the most desirable structure.

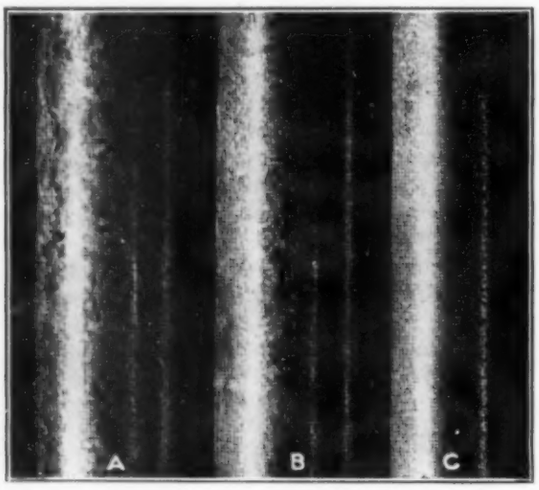


FIG. 2—GRAIN SIZE SHOWN ON MACHINED BAR. × 1

In Table I there is one bar, numbered 1706 (6), which shows a remarkable ultimate strength of 52,500 lb. per sq.in. The full results of the tensile tests on this bar were as follows: Yield stress, 38,000 lb. per sq.in., maximum stress, 52,500 lb. per sq.in., extension on 2 in., 14 per cent; reduction of area, 15 per cent. Under the microscope the individual particles have a well-rounded form, and are arranged in a manner suggesting that the original cast network was exceptionally fine.

While it might perhaps be hoped that chill-castings of the "Y" alloy could regularly be obtained having the remarkable properties of this exceptional bar, it is probable that the conditions of heat-treatment required lie so close to the limit of safety that it would not be practicable to employ them regularly in industrial practice. The authors are therefore inclined to regard the results set out above, leading to a regular value of the ultimate stress in the neighborhood of 45,000 to 47,000 lb. per sq.in., as satisfactory, particularly as the properties of the alloy in this condition are very good from the point of view of resistance to fatigue, as shown below.

Grain Size

In the preparation of batches of castings for density determination, the very fine machined finish employed revealed the grain size of the castings, and it was noticed that a considerable difference existed in the grain size in spite of the fact that the conditions of

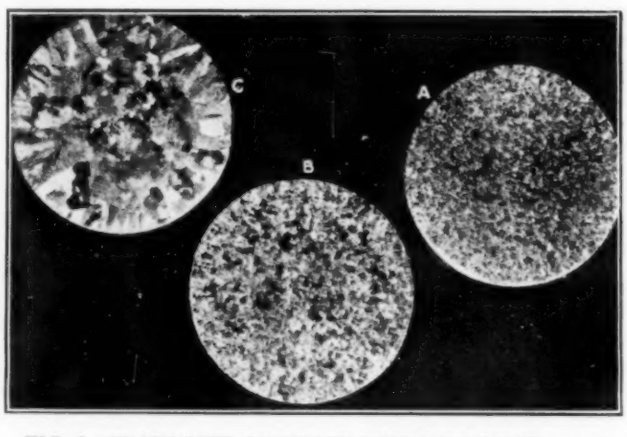


FIG. 3—GRAIN SIZE ON CROSS-SECTION OF BAR. × 3

castings had been regulated with the greatest care. The only variable was the rate of pouring, which could be controlled only by personal judgment. The various grain sizes observed can conveniently be grouped as *A* (coarse), *B* (medium) and *C* (fine). Fig. 2 shows the machined surface of the castings, while the corresponding densities are given in Table II. It will be seen that the finer structure corresponds with a higher density. Fig. 3 shows transverse sections through the castings.

TABLE II—RELATION OF GRAIN SIZE TO STRENGTH

Grain Size	Density* Machined Test	Ultimate Stress Lb. Per Sq.In. (as Cas
A (Coarse)	2.772	21,500
B (Medium)	2.783	24,400
C (Fine)	2.790	28,200

*Rough machined test-piece.

To test the effect of variations of pouring rate on grain size a series of bars has been cast, keeping other conditions as constant as possible, while the time taken to fill the mold was carefully determined. Transverse sections of castings poured at five different rates are shown in Fig. 4, under a magnification of two diameters. (Time in seconds to pour each bar is noted on the cut.) An examination of these macrographs suggests that it is important to secure, if possible, an even closer control of the rate of pouring. In order to obtain the best results it is necessary to aim at filling a mold 7 in. long by 1 in. diameter in not less than 10 seconds; the slower the rate the better the result, provided that cold shuts can be avoided.

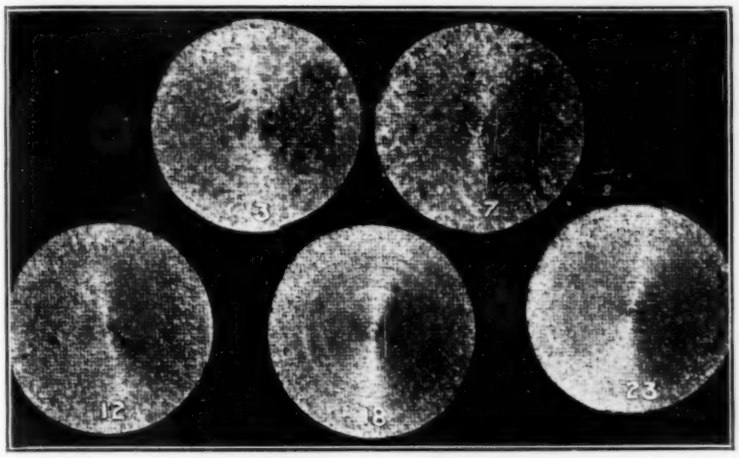


FIG. 4—INFLUENCE OF POURING RATE. × 2

Broken blisters on the surfaces of cast bars which had been heat-treated in molten nitrates at 530 deg. C. have been observed, even where the castings had been made in the improved and lighter molds, and showed satisfactory density, particularly with a batch heat-treated for 6 hours at a temperature ranging between 534 and 517 deg. C. Microscopic examination of a cross-section taken through one of these blisters appeared to indicate that superficial melting might have taken place, the molten salt penetrating into cavities left by the removal of liquid metal.

Since the blisters appeared to be merely superficial, the bars were tested in the usual way and gave the results shown in Table III.

TABLE III—TESTS ON BLISTERED BARS

Melt No.	Corrected Density* Grams Per c.c.	Yield Stress Lb. Per Sq.In.	Ultimate Stress Lb. Per Sq.In.	Elongation Per Cent in 2 In.
1706 (6)	2.789	38,000	52,500	14
1712 (3)	2.781	34,400	41,500	4
1712 (8)	2.781	35,000	40,400	4
1706 (5)	2.777	32,800	41,400	5
1712 (7)	2.777	31,600	43,600	6

*Roughed-out test-pieces (heat-treated).

It will be seen that in general the results are good and consistent. Indeed, one of the bars is an exceptional one, to which reference has already been made.

This observation negatives the previously held idea that the discoloration of fractures referred to above might in some way be connected with the formation of blisters. The fact that there is no connection between these two phenomena has been further verified by a series of other tests.

In parallel sets of experiments it was found that heating above 525 deg. C. in the salt bath produced blisters, while in the electric muffle furnace a temperature of 545 deg. C. could be reached without blistering. The temperature 525 deg. C. must therefore be regarded as a limit for "Y" alloy castings when in contact with fused salt. This temperature is too low to allow blistering to be explained by partial melting of the alloy, particularly as treatment in an electric muffle furnace at that temperature shows no signs of any such action. It would seem probable, therefore, that chemical action between the fused nitrates and the alloy plays a part in the production of the blisters, possibly by causing a local rise in temperature. Presence of magnesium appears to affect this phenomenon fundamentally, since it was found that an alloy containing copper 4 per cent, nickel 2 per cent, aluminum remainder, could be heated to 550 deg. C. in the salt bath without blistering.

Further investigation was accordingly abandoned, and the electric muffle was adopted for obtaining the highest possible results with "Y" alloy. In order to secure uniformity of temperature they were inclosed in a box made of sheet iron and lined internally with ½-in. asbestos. This arrangement proved perfectly satisfactory and gave uniform results.

In each of several batches of bars, the successive heat-treatments were carried out with intermediate quenching of the bars. If microscopic structure was not found satisfactory, the bars were not allowed to age, but were slowly reheated to the temperature of treatment.

The microstructure of the casting at a magnification of 300 diameters (the section being unetched) shows the network constituent plainly apparent. After a first heating period of approximately 2 hours at 520 deg. C., the microstructure has changed; the thick and continuous network has begun to disappear and to break up in places. This change is more markedly visible at the end of the second period of heat-treatment (5 hours in all). The final stage reached at the end of the heat-treatment (10 hours in all), and regarded as satisfactory for this purpose, is shown in Fig. 5 at the same magnification.

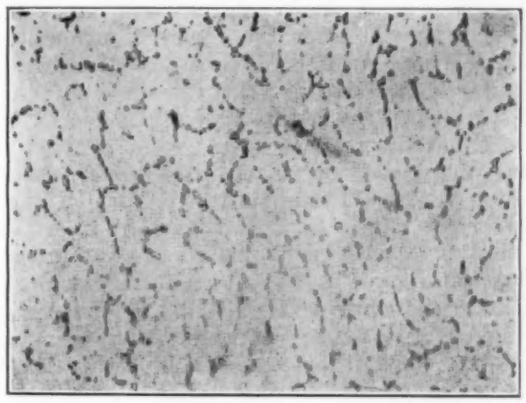


FIG. 5—SATISFACTORY MICROSTRUCTURE ON CHILL CASTING. QUENCHED IN BOILING WATER AFTER 10 HR. AT 520 DEG. C. UNETCHED. × 300

It will be seen that here the network structure is only faintly traceable and that the intermetallic compounds present in the alloy have to a large extent become balled up.

It will thus be seen that the heat-treatment process applied to this allow bears some small resemblance to the malleableizing process applied to cast iron. It must be borne in mind, however, that there are changes in this alloy which are not revealed by an examination of the microstructure. A part of the purpose of heat-treatment is to bring into solid solution constituents which in the condition of the alloy as cast exist as separate constituents. Similarly, the changes which occur during aging and hardening are not readily seen under the microscope, although their nature has been fairly fully elucidated.

It may be mentioned that in each of these cases the alloy has been remelted. It is an incidental observation from the present research that remelting, so far from being disadvantageous to this alloy, is, if properly conducted, distinctly advantageous. Consistently su-

perior results have been obtained from castings made from remelted alloy.

Fatigue Range

The remarkably high and consistent values obtained in tensile tests on heat-treated chill-cast bars, prepared in the manner described above, made it of interest to ascertain the resistance of such treated castings to fatigue, particularly in view of the possibility of the employment of such material for moving parts of machinery. Determinations of the fatigue range have therefore been carried out in the engineering department of the National Physical Laboratory by H. Gough.

Hollow Test-Pieces—Tests of the Wöhler type on hollow test-pieces were carried out by means of the strain-load method. These indicated the limit of proportionality at a value of ±5.8 tons per sq.in. The tests, however, on the hollow test-pieces were somewhat unsatisfactory and inconsistent, as several test-pieces broke at points away from the region of maximum stress. Such results are not surprising, in view of the fact that the shape of the curve obtained in the determination of the limit of proportionality was of the kind which would be expected from a material not completely homogeneous, or containing slight flaws. In such cases the use of hollow specimens gives unduly low values.

Solid Test-Pieces—Solid test-pieces used in a similar manner gave perfectly consistent results.

A series of gradually increasing loads was applied to seven specimens. After the required number of reversals had been endured for each individual test-piece, the load was increased and a further test made on the same specimen. The results shown in Table IV clearly indicate that the fatigue range of the alloy is raised by preliminary understressing in the manner described.

Taking the results from the initial loads in each case, and therefore eliminating the advantage from preliminary understressing, the figures are as given in Table V.

The results given in Table V indicate that the material has a safe range under alternating stresses of approximately ±15,700 lb. per sq.in. This is a remarkable value, since it is considerably higher than any which have yet been recorded for light aluminum alloy castings and is not very much below the value for the best wrought-aluminum alloys which show a range of the order of ±22,000 lb.

Mold Wash

The use of graphite molds having been developed in the laboratory in connection with work on other alloys, those molds were tried for the production of "Y" alloy cast bars. The result was quite successful, but the bars produced are not in any way superior to those obtained from the light type of cast-iron mold having the 3:1 ratio of cross-sectional area.

One of the advantages of the graphite molds, not so readily obtainable in iron, is the high quality of surface which can be obtained in the resulting castings. In order to lessen the development of "cold sheets" with very slow rates of pouring various mold dressings have been used. A thick paste made by mixing "00 superfine" plumbago with some fairly thick lubricating oil has proved very effective. This paste is applied with a brush, only a thin film being necessary, and is then smoothed over with the finger.

Summary

By proper proportioning of the cross-sectional area of the mold to the cross-sectional area of the casting, and careful control of casting conditions, it has been found possible to eliminate marked axial unsoundness.

The conditions which have been found to give the best results are as follows:

(*a*) The ratio of cross-sectional area of mold (gray cast iron) to that of the casting to be 3:1.

(*b*) The mold, dressed with a thick paste of plumbago and lubricating oil applied in a thin film, to be heated to 150 to 200 deg. C. and used tilted to an angle of 30 deg. to the vertical.

(*c*) The temperature of the alloy in the crucible during melting not to exceed 800 deg. C.

(*d*) The molten alloy to be poured at 750 deg. C. in a slow stream, striking the mold as near the top as possible to avoid the danger of a "hot spot."

(*e*) The time taken to fill the mold 7 in. deep by 1 in. diameter to be not less than 10 seconds.

Rods cast in accordance with the above conditions show tensile strength in the neighborhood of 45,000 lb. per sq.in. and from 5 to 6 per cent extension on 2 in. If their density is satisfactory (2.79 grams per c.c.) such results can be regularly relied upon after proper heat-treatment.

No change in density has been observed to result from heat-treatment.

It has been found that cast heat-treated rod prepared as described in the present paper will withstand twelve million reversals of a maximum fiber stress of 15,700 lb. per sq.in.

TABLE IV—FATIGUE TESTS

Melt No.	Maximum Applied Stress ± Lb. Per Sq.In.	Reversals	Remarks
1787 (9)	±12,800	19,066,400	Unbroken.
	±17,700	990,100	Broken at point where maximum stress = ±16,100 lb. per sq.in.
1790 (4)	±13,700	19,275,900	Unbroken
	±16,600	13,623,000	Unbroken.
	±18,400	9,690,000	Unbroken.
	±21,300	3,404,100	Unbroken.
	±26,000	24,510	Broken.
1790 (5)	±16,100	1,183,700	Broken.
1790 (7)	±15,500	13,930,000	Unbroken.
	±17,500	10,735,000	Unbroken.
	±20,200	1,504,800	Broken.
1790 (12)	±17,500	8,390,200	Broken at point where maximum stress = ±16,800 lb. per sq.in.
1790 (16)	±15,700	876,000	Unbroken.
	±20,600	876,000	Broken at point where maximum stress = ±18,800 lb. per sq.in.
1790 (20)	±20,400	1,419,000	Broken.

TABLE V—FATIGUE LOADS

Melt No.	Range of Stress. Lb. Per Sq. In.	Alternations Endured	Remarks
1787 (9)	±12,800	19×10^6	Unbroken.
1790 (4)	±13,700	19×10^6	Unbroken.
1790 (7)	±15,500	14×10^6	Unbroken.
1790 (16)	±15,700	12×10^6	Unbroken.
1790 (5)	±16,100	1.2×10^6	Broken.
1790 (12)	±17,500	8.4×10^6	Broken.
1790 (20)	±20,400	1.4×10^6	Broken.

Heat-Treatment

The use of temperatures exceeding 525 deg. C. during heat-treatment in a salt bath has been found to cause blisters to form on the surfaces of castings. Excellent results have, however, been obtained from tensile tests of test-pieces machined from blistered rods.

At a temperature of 520 ± 5 deg. C., 6 hours is a sufficiently long period of heating. Quench in boiling water, and age for 8 days before testing.

The plunging of the cast rods at normal temperature directly into the salt bath at 520 deg. C. has been found to be perfectly safe and free from danger of causing cracking. Similar remarks apply to quenching in boiling water.

Legal Notes

By Wellington Gustin
Of the Chicago Bar

Dealings With Agents

Nature and Extent of Authority Must Be Ascertained by Those Doing Business With Them

Important and pertinent questions regarding relations between agents and their principals as well as the dangers of purchasing from agents not authorized to sell are brought out in a number of suits involving the dealings of W. B. Tredwell, a stevedore, weigher, forwarder and customs broker at Hampton Roads.

In these capacities he was employed by W. R. Grace & Co. to enter and unload into cars cargoes of nitrate of soda, directing the consignments as ordered by Grace & Co. from their New York office. It appears he had no other authority nor was he held out by plaintiff as having authority to make sales or collect money.

During July, 1918, two carloads of nitrate which Tredwell was directed to consign to the Aetna Explosives Co. and the King Powder Co. were diverted by him to the Richmond Guano Co. in fulfillment of a contract of purchase made in good faith between this company and R. E. De Jarnette, a fertilizer broker. The guano company received the nitrate and paid De Jarnette without notice that it was the property of Grace & Co. To cover the theft, Tredwell consigned two cars of nitrate imported for the government to Aetna and King, who paid Grace & Co. for these. When the discovery was made in September, 1918, Grace & Co. paid to the government the amount unwittingly received and brought suit against the guano company.

Purchaser Must Ascertain Facts

The law in this case is simple on the above facts. There was no evidence whatever that Grace & Co. authorized Tredwell to sell its nitrate or by any course of conduct or any single act led any one to believe that he was authorized to sell. On the contrary, he was known to the public as a stevedore, weigher and shipper, and not as a dealer in nitrate either for himself or as an agent. On these facts a purchaser from such a person buys at his peril and does not acquire title against an importer and owner whose goods the stevedore, weigher and shipper is handling in due course of business. Judgment for the plaintiff has been affirmed in the Circuit Court of Appeals, 284 Federal 801.

Further points are developed in a series of judgments obtained by the Du Pont company against various purchasers of other lots of nitrate diverted by Tredwell. Defences to these various actions were: (1) That Tredwell was authorized by plaintiff to sell; (2) that plaintiff so conducted its business that defendants were justified in believing that Tredwell was authorized to sell; (3) that plaintiff is estopped from repudiating the authority of Tredwell to sell by its negligence in failing to discover the alleged unauthorized sales, and its negligence in failing to give prompt notice of the discovery.

In passing on the question of the agency of Tredwell the court lays down many rules. It says an importing corporation's employment of a person as stevedore to unload and weigh its cargoes of nitrate, as customs broker to settle with customs officials, and as a forwarder to consign the carloads of nitrate as ordered implied agency to do whatever was necessary to such services; but an agency so limited, accompanied by custody of the property for the purposes of the agency, not only did not confer authority to sell, but negatived such authority.

The evidence was conclusive, the court holds, that plaintiff did not directly or indirectly confer authority to sell. Again, it says those who deal with agents must ascertain at their peril the scope of the agency. "The mere fact that one is dealing with an agent, whether the agency be general or special, should be a danger signal, and, like the railroad crossing, suggests the duty to 'stop, look and listen,' and he who would bind the principal is bound to ascertain not only the fact of agency but the nature and extent of the authority, and in case either is controverted the burden of proof is upon him to establish it."

In affirming judgments of the trial court in these cases the Circuit Court of Appeals of the United States says the regrettable losses of defendants are the result of the blind assumption without the least inquiry that an agent employed to unload and ship nitrate as directed by his principal had authority to sell it, and that, too, when the agent was known to the public as a stevedore, shipper and custom house broker.

The U. S. Supreme Court on appeal by certiorari has affirmed these principles by denying the writ sued out in this case.

Failure to Disclose Process Voids Patent

Mere Claim of Use of Fatty-Acid-Free Coconut Oil Homogenized Milk Is Not Invention

The Crary and Barnett patent, No. 1,193,477, for a food product and process of manufacture, was held void by a recent decision in the United States Circuit Court of Appeals as regards claim 7, which, it was held, did not disclose invention over the prior art. A suit, alleging infringement, was based upon this claim:

"As an article of manufacture, a food product consisting of a concentrate of skimmed cow's milk and coconut oil from which the free fatty acids have been removed, the mixture being homogenized."

The Court of Appeals says the Federal District Court was warranted in finding it was old in the art to combine as a food product skimmed cow's milk and vegetable oils, including coconut oil, the mixture being homogenized. In every respect, therefore, says the court, save as to the element of removal of the free fatty acids from the oil, the claim is met by the prior art or practice. Now the court pointed out that if the patentees in this case did succeed in eliminating "principally" or wholly the free fatty acids from coconut oil, their discovery lay in the way in which this could be done, and not that its reduction or elimination would improve such a product.

However, the court found no disclosures in the patent pointing out how this could be done, and nothing was disclosed whereby the public generally or those skilled in the art might produce "coconut oil from which the free fatty acids have been removed." In want of such disclosure alone the court held claim 7 of the patent void and dismissed the bill claiming infringement.

Equipment News

From Maker and User

Machinery and Appliances for Production and Control

Materials and Accessories for Chemical Industries

New Model Platform Truck

Industrial trucks and tractors have been on the market for a number of years now and their use has been gradually extended until they are now recognized as necessary accessories in many different industries.

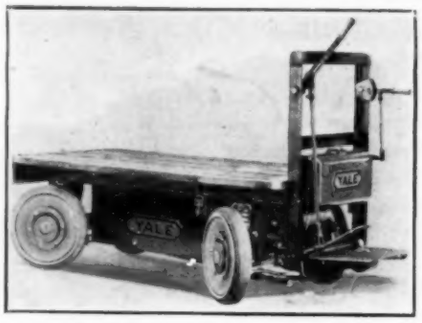
Having reached this status, the time was ripe to put the manufacture of this equipment on a standard production basis. Mass production and the interchangeability of parts, which have been so successfully applied in automotive industry, are being recognized by industrial truck manufacturers as the future need for their industry.

It is, therefore, with much interest that we note the announcement of a new line of trucks and tractors, the distinguishing characteristic of which is interchangeability of parts and low price based on quantity manufacture. The line is being placed on the market by the Yale & Towne Manufacturing Co., of Stamford, Conn.

The first of this line to be put forward are the Model K-20, a narrow high-platform truck for general utility purpose, and the Model K-21, a wide high-platform truck for the same use.

These models are designed to meet the general requirements of economical intra-plant movements of material. They will handle miscellaneous units of material which can be placed on the platform by hand, by chain block, electric hoist, ship's tackle, or overhead crane. Auxiliary equipment designed for these models includes a gravity dump body for handling loose materials and an electrically operated swinging boom crane. The makers claim that each of these trucks installed will release from three to eight men from the non-productive work of manual handling for jobs of a more profitable nature.

Large wheels and full spring suspension are provided to permit efficient operation over rough surfaces. The control has been made as flexible and responsive as possible in order that handling costs will be low in narrow aisles and congested places.



YALE MODEL K-20 INDUSTRIAL TRUCK

The majority of single parts and unit assemblies in the model K-20 truck are standard and interchangeable with those of all other models in this series of Yale industrial trucks. Where two or more different Yale K-model trucks are used in one plant, this interchangeability offers definite operating advantages and economies. Because of this interchangeability, considerable economy in truck manufacture is effected, thus establishing new standards of value in industrial truck transportation systems.

Among the various specifications of these models we mention the following as of interest: Capacity, 4,000 lb. Weight with battery, but no load, approximately 2,500 lb. Platforms, K-20, 84x38 in., K-21, 84x46 in. Overall dimensions, 102½ in. long, 38 to 46 in. wide and 53⅜ in. high. Clearance 5 in. Turning radii, 42 in. inside, 91 in. outside. Minimum width of aisles for 90 degree turn, 49 in.

The speed empty on a level concrete pavement is 8½ miles per hour. On same pavement with full load the speed is 6¼ miles per hour. The speed on a 10 per cent grade with full load equals 2¼ miles per hour. The acceleration is full speed in 60 ft. from a standing start when carrying full load.

The frame of this truck is of pressed steel, integral with the battery box. The motor is a series wound motor, totally inclosed, of 36 volt, 45 amperes, 1,800 r.p.m. continuous rating. The truck is equipped for Exide Ironclad or Edison storage batteries.

The Venturi Stack

Cast your memory back to the pictures of locomotives you saw when you were a child and you will recollect that the stacks were more often than not of venturi shape. Indeed this practice was nearly universal at one time. But since then the trend of development in America has been in other directions, and it is only in Europe that the venturi stack has continued in use and undergone an evolution toward improved practice. European practice has developed a stack that permits of saving a large proportion of the heat in the exhaust gases.

Recently Schutte & Koerting Co., of Philadelphia, Pa., has reintroduced this type of stack into the United States. After trying it out thoroughly for some years in several large manufacturing plants, this company has begun to take orders and in the last few months has made quotations on venturi stacks of various metals and alloys for chemical plant use.

The principle on which this stack works is as follows: It is a system of induced draft in which the gaseous products of combustion are discharged through a stack into the atmosphere on the ejector principle. It consists of a vertical steel stack shaped like a venturi tube, an ejector nozzle located just below the center of the throat or contracted section of the stack, a low-pressure blower, and the necessary breeching.

The bottom or entrance section of the stack resembles the frustum of a cone. This is joined to the throat or contracted section, which in turn is connected to the top or diverging conical section of the stack. The top section flares outward, and this construction reduces progressively the upward velocity of the gases, so that they are discharged into the atmosphere at a low velocity.

The draft is induced by a "motive gas" which is discharged through the nozzle at relatively high velocities. The draft is controlled by adjusting the "motive gas" pressure by means of varying the blower speed.

Two general arrangements of the venturi stack are in use—one in which air under pressure is employed as the "motive gas," and the other in which a small portion of the stack gases is so used. The former is known as the outer circuit system, the latter as the inner circuit system.

The results obtained with either arrangement are practically the same. However, with the second method, or inner circuit system, the stack gases are not chilled by the introduction of relatively cool air, hence the natural draft of the stack is not impaired and a higher overall efficiency is obtained. Furthermore, the total amount of gases to be handled by the stack is less than in the outer circuit system.

The manufacturers claim that this type of stack is installed to advantage when one or more of the following conditions obtain:

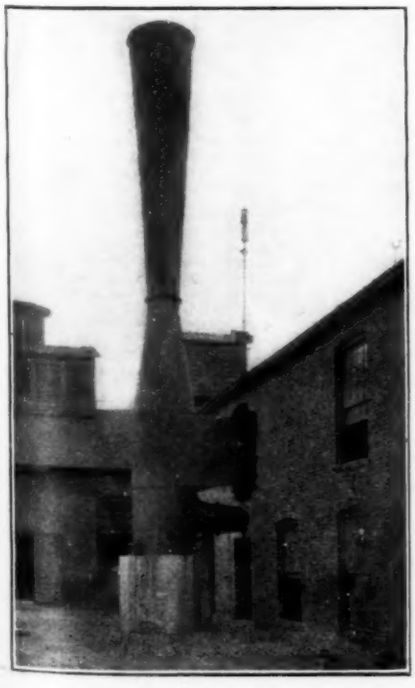
(*a*) As a substitute for a high stack.

(*b*) Where the rates of combustion are high.

(*c*) If fuels requiring intense draft are to be burned.

(*d*) Where certain stokers, like the underfeed, are used.

(*e*) Where the stack gas temperature is low, as when economizers are used.



THE VENTURI STACK

(*f*) Where the foundations necessary for supporting heavy stacks cannot be built.

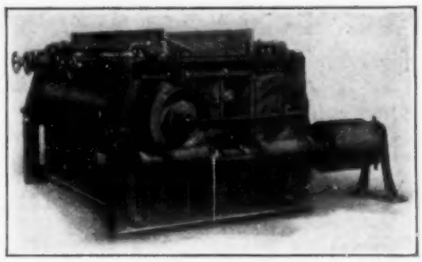
(*g*) In all instances where the initial cost and maintenance are less than the corresponding items for an ordinary stack of requisite capacity.

Besides its primary application in steam boiler work, the venturi chimney induced draft system is well adapted for use in connection with chemical plants for purposes of ventilation and the removal of obnoxious gases, in connection with sulphuric acid chamber plants for removing the gases from the Gay-Lussac tower, in large cement kilns, brick and porcelain kilns, furnaces for melting metals and other materials, heating furnaces, and wherever a substitute for a brick stack is required.

New Type Atmospheric Drier

A new type of atmospheric drum drier, designed to dry semi-solid materials that are not injured by atmospheric drying or sensitive to moderate temperatures, has been added to the standard line of driers built by the Buffalo Foundry & Machine Co. The company reports that it has a number of orders already booked, and that it intends to manufacture it as a standard piece of apparatus. The new machine, which has been completed and tested but recently, is of the double drum type. It embodies some novel features which it is claimed facilitate its operation and reduce to a minimum the attention that it requires in service.

The machine consists of two hollow, steam-heated drums, running parallel one to the other. The outer surfaces of these drums have been ground perfectly smooth and to accurate dimensions. The material to be dried is fed between the rolls at the top, and is prevented from running through between the drums by adjusting the clearance between them. However, the clearance is sufficient to allow the surfaces of both drums to be coated evenly with the material to be dried. The drums turn toward each other, and downward, carrying a coating on their heated surface. Before a single revolution of the drum has been completed, the material coated on the drum has been dried and is removed by long knives which scrape it from the drum surfaces. There is a knife on each side of the machine. Adjustable knife holders permit the



"BUFLOVAK" DOUBLE DRUM DRIER

blades to be adjusted to the best advantage. The dried material falls into hoppers provided at both sides of the machine, and is carried by helical conveyors to an elevator which deposits it in suitable storage bins.

A vapor hood is provided so that the vapors may either be conducted through vapor scrubbers or disposed of in other ways, such as individual cases may demand.

The driving mechanism for the drums consists of two bronze worm wheels, each keyed to the trunnions on which the drums turn, and two hardened and ground worm gears. Two ball-bearing thrusts are provided. The whole mechanism is inclosed and operates in a bath of oil.

Ruggedness, accessibility and ease of operation briefly describe the underlying principles that the manufacturers claim for the new design. The frames of the machine are exceptionally rigid, and are provided with heavy ribs. The design is not only extremely simple but is so arranged that all of the parts that might require attention in operation are readily accessible. Ease of operation arising from the extreme simplicity of the machine permits even an inexperienced operator to produce satisfactory results.

Recent tests indicate that the machine will have greater capacity for its size than similar models built heretofore. Its lowered steam and power consumption effect a lowered manufacturing cost in the dried product. The use of ball thrust bearings even in the packing glands is instrumental in lowering power consumption.

Catalogs Received

NORTON CO., Worcester, Mass.—A book entitled "Tool and Cutter Grinding," which is a catalog of Norton universal tool and cutter grinding machines, which also gives information as to the proper solution of problems in grinding of this nature.

ROSS-TACONY CRUCIBLE CO., Tacony, Philadelphia, Pa.—A new catalog showing the recently adopted American standard sizes for crucibles manufactured by this company.

AACONE ENGINEERING CORPORATION, North Plainfield, N. J.—A leaflet on the Aacone pebble mill.

Review of Recent Patents

Some Patents in the Field of Fuel and Gas

Byproduct Plant Equipment, Blast-Furnace Gas, Coal Cleaning and the Use of Powdered Coal Are Subjects of Recent Inventions

THE recovery of various byproducts incidental to the process of manufacturing coke has long been the object of much inventive effort. Among the recent additions to the long list of patents on this type of equipment we note an apparatus for concentrating ammonia liquor for the purpose of recovering therefrom various salts such as ammonium and calcium chlorides. (1,455,299, F. F. Marquard and Carl W. Littler, May 15, 1923.)

In this equipment, the ammonia liquor is circulated from a catch basin into the top of a tower, through which it is sprayed counter-currently to a rising current of hot gases. After passing through the tower the liquor falls back to the catch basin and is recirculated on this cycle until completely evaporated or sufficiently concentrated to permit the removal of the salts which it contains.

Cooling Coke-Oven Exhaust Mains

The modern coking plant is often equipped with a main for carrying away or exhausting the smoke released from the ovens during the charging operations. There is a certain liability to explosion in these mains because of the combustible contained in the smoke coming into contact with the hot walls of this main.

A means for cooling such mains and hence reducing the chances of explosion is provided in a recent patent. (1,455,059, J. van Ackeren, assignor to the Koppers Co., of Pittsburgh, Pa., May 15, 1923.) This invention consists primarily in providing a pipe for cooling water over the top of the main. This pipe has numerous outlets which permit a film of water to flow over the outside surface of the main into gutters located on either side of the bottom of the main. The gutters are located outside the main and holes in the sides of the main permit the water to flow to the inside and flood the bottom of the main. A dam is installed at one end of the main at which the water overflows and hence serves to keep the water in the main at constant level. This water within the main, besides having a certain cooling effect, also takes up a great part of the coal dust from the smoke and in this way also reduces the liability to explosion.

Cleaning Blast-Furnace Gases

The use of blast-furnace gases for such purposes as heating hot blast stoves, firing boilers and operating gas engines is of long standing. These gases contain a certain amount of dust and finely divided solid matter and in order to employ them most efficiently it is desirable to remove this matter.

There are many processes used to accomplish this end; but the fact that the subject is still of interest to inventors would indicate that there is room for improving the customary practice. One of the new patents on this subject (1,455,834, Ambrose N. Diehl, May 22, 1923) consists in passing the gases through a screen to remove this matter. At intervals the path of the gases is reversed and their velocity increased, which serves to clean the

American Patents Issued July 3, 1923

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,460,389—Liquid-Dispensing Station. P. A. P. V. Mauclère, Paris, France.

1,460,395—Pickling Bath and Process for Pickling Iron and Steel. O. Vogel, Dusseldorf-Oberkassel, Germany.

1,460,396—Plaster and Process of Controlling the Setting of Plaster, an Accelerator Therefor, and Process of Making Such Accelerator. J. N. Wiggin, East Orange, N. J., assignor to H. B. Wiggin's Sons Co., Bloomfield, N. J.

1,460,414—Apparatus for Devolatilizing Coal Shale, Etc. C. M. Garland, Chicago, Ill.

1,460,422—Synthetic Tan and Process of Making Same. S. Kohn, Philadelphia, Pa., assignor to Rohm & Haas Co.

1,460,488—Process of and Apparatus for Making Sheet Glass. W. E. Heal, Washington, D. C.

1,460,490—Gas Scrubber. H. G. Johnston, Corsicana, Tex., assignor to G. Johnston, Corsicana, Tex.

1,460,545—Production of Ethylene. P. E. Haynes, Buffalo, N. Y., and G. O. Curme, Jr., Pittsburgh, Pa., assignors to Linde Air Products Co., Cleveland, Ohio.

1,460,565-6—Apparatus for the Destruction of Refuse. R. Balmer, Toronto, Ont., Canada.

1,460,582—Method of and Apparatus for Drawing Sheet Glass. S. B. Henshaw, Charleston, W. Va., assignor to Libbey-Owens Sheet Glass Co., Toledo, Ohio.

1,460,606—Process for Manufacturing Condensation Products. K. Ripper, Vienna, Austria, assignor to Fritz Pollak, Vienna, Austria.

1,460,621—Apparatus for Manufacturing Lime Sulphur. R. Taki, Abe-Gun, Shizuoka-Ken, Japan.

1,460,638—Process and Apparatus for Coking the Discharged Material From Low-Temperature Distillation Apparatus. E. Barrs, London, England.

1,460,695—Lubricating, Cleaning and Painting Apparatus. F. A. Bannon, Dallas, Tex., assignor, by direct and mesne assignments, of two-thirds to R. Keller and one-third to W. A. Thornton, both of Dallas, Tex.

1,460,699—Pigment and Paint. H. S. Blackmore, Mount Vernon, N. Y.; I. Blackmore and S. L. Tingley administrators of said H. S. Blackmore, deceased.

1,460,704—Soap Dissolver and Agitator. A. T. Celler, Brooklyn, N. Y.

1,460,708—Process of Manufacturing Diazodinitrophenol. W. M. Dehn, Seattle, Wash.

1,460,718—Process of Purifying and Dehydrating Switch Oil. C. H. Hapgood, Nutley, N. J., assignor to De Laval Separator Co., New York, N. Y.

1,460,731—Tumbling Barrel. G. B. Pickop, New Haven, Conn., assignor to Malleable Iron Fittings Co., Branford, Conn.

1,460,736—Enzymic Substance and Process of Making the Same. J. Takamine, New York, N. Y., and J. Takamine, Jr., Clifton, N. J.

1,460,764—Stuffing Box for Rotary Driers, Kilns, Calcining Furnaces, Retorts, or the Like. H. Nielsen, London, and B. Laing, Hatfield, England.

1,460,774—Manufacture of 2-Oxy-1-Arylnaphthylamines. A. Wahl, Enghien, and R. Lantz, Paris, France, assignors of nine-tenths to Société Anonyme des Matières Colorantes & Produits Chimiques de Saint-Denis, Paris, France.

1,460,828—Process of Sealing Vertical Coking Chambers. J. Schäfer, Dortmund, Germany.

1,460,829—Reversing Mechanism for Byproduct Coke Ovens. L. F. Schrader, New York, N. Y., assignor to Foundation Oven Corp., New York.

1,460,830—Metallurgical Process. H. G. C. Thofehrn, Roselle Park, N. J. D. H. McLean, administrator of said H. G. C. Thofehrn, deceased.

1,460,836—Glass-Mold Burnishing Process and Apparatus. S. F. Arbuckle, Detroit, Mich., assignor to Monogram Lens Corp., New York, N. Y.

1,460,872—System for Cooling Flue Gases. H. H. Utley, Florence, Colo., assignor to River Smelting & Refining Co., St. Louis, Mo.

1,460,876—Process for the Manufacture of Ketones. R. R. Williams, Chicago, Ill., and D. H. White, Berlin, N. H., assignors, by mesne assignments, to S. B. Hunt, trustee, Mount Kisco, N. Y.

1,460,888—Method of Continuously Melting Vitreous Enamels. F. D. Cook, Fairmont, W. Va.

1,460,898—Process of Making Nitrates. H. Hampel, Halle, Germany.

1,460,916—Method of Burning Pulverized Fuel. J. E. Muhlfeld, Scarsdale, and V. Z. Caracristi, Bronxville, N. Y., assignors to Locomotive Pulverized Fuel Co., New York.

1,460,933—Apparatus for Molding Plastic Substances. R. H. S. Abbott and J. B. Close, London, England.

1,460,938—Method of Mixing or Masticating Heavy Plastic Material. D. R. Bowen and C. F. Schnuck, Ansonia, Conn., assignors to Farrel Foundry & Machine Co., Ansonia.

1,460,960—Air Separator. William A. Gibson and C. E. Needham, Allentown, Pa., assignors to Bradley Pulverizer Co., Boston, Mass.

1,461,017—Apparatus for the Conversion and Transformation of Liquids, Fluids and Oils. J. H. Adams, Flatbush, N. Y., assignor to Texas Co., Houston, Tex.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

screen. The gases on this reversed run are passed through a separator which imparts to them a centrifugal motion and thus causes the solid matter to be thrown out. After passing through the separator the gases from the reversed run are passed back into the stream of uncleaned gases.

Cleaning Coal

Most coal, as it comes from the mine, contains various impurities which must be removed before the coal can be successfully marketed. Among these impurities are slate and bone coal.

As a method of removing these from the pure coal, it is proposed (1,455,469, Wilson D. Althouse, May 15, 1923) to introduce the coal as it comes from the mine, preferably in lumps of 1 in. or less size, into an ascending column of air. This air column is to have sufficient force to lift and carry with it all material of lower specific gravity than slate, the slate falling and being led away.

After the slate is thus removed, the air column carrying the remaining material is deflected sharply and an additional regulated supply of air is admitted. This serves to increase the volume of air and reduce the velocity to a point where the bone-coal, which has a specific gravity higher than pure coal yet lower than slate, falls from the air stream. The pure coal is carried beyond this point and then separated from the air stream.

Burning Powdered Coal

The burning of powdered coal is becoming of continually greater interest to users of fuel. A new apparatus for accomplishing this purpose is described in some recent patents. (1,457,521 and 1,457,522, A. J. Grindle, assignor to Grindle Fuel Equipment Co., of Chicago, Ill., June 5, 1923.)

The object of this equipment is to feed a uniform and regulated amount of powdered coal into a uniform and regulated volume of air and delivery of the mixed air and fuel to a jet burner at the furnace. The coal is taken from the hopper by a screw and fed between two plates, one revolving with the screw and the other stationary, their plane being perpendicular to the axis of the screw. These plates are situated in a conduit which leads from a blower that supplies a regulated air blast. The speed of the screw regulates the delivery of powdered coal and the plates break it up so that it enters the air stream as a uniform stream of powder and not in compact masses as the screw would deliver it.

Beyond the point where the regulated amount of fuel is mixed with the regulated blast of air, an expanding connection serves to reduce the velocity of the blast. Between this and the burner proper is a flattened connection. In this section, just before the flattening commences, is placed a removable section which contains fixed vanes. These vanes deflect the stream of air and fuel and mix it thoroughly before the burning occurs.

New Patent on Phonograph Records

Suggested Improvement in Manufacture of Thermoplastic Composition by the Columbia Graphophone Co.

In thermoplastic compositions in which two of the ingredients are flock and shellac, difficulty is experienced in thoroughly saturating the flock with the shellac without overheating the shellac or without the addition of substances that deleteriously affect the final product. If a mixture of shellac and flock is heated to a temperature at or near the melting point of shellac and kept at such temperature for a protracted period, the shellac loses much of its original strength and elasticity, although under these conditions a proper compounding of the shellac and flock can be effected.

It is the object of a recent invention to provide a common solvent for the copal and shellac resins so as to make possible the compounding of such resins into one homogeneous mass having the advantages of the greater hardness and high crushing strength of the copal resins and the toughness and elasticity of the shellac resins; and the inventor claims to have discovered that the unsaturated fatty acids derived by splitting off the glycerine from drying oils such as linseed oil, perilla oil, china wood oil, etc., are common solvents of the said resins; said acids belonging to the linoleic and olefinic groups.

Thermoplastic compositions usually consist of a filler, which may be baryta, china clay or the like; fibrous material commonly known as flock; suitable coloring matter; and a binder, the latter comprising in the present instance shellac and copal resins combined with the solvent. The proportions by weight giving the best results for the manufacture of phonograph records are: shellac, 20 to 30 parts; filler, 60 to 70; coloring matter, say, 2; copal, 4; flock, 7; copal and shellac solvent, 1. The shellac, filler and coloring matter are finely comminuted and all thoroughly mixed. The copal, flock and common resin solvent are mixed and heated to a moderate temperature, say 265 deg. F., for a period long enough to effect thorough saturation of the flock; 30 minutes, more or less, will usually be found sufficient. The time required depends somewhat upon the total quality of the mixture, but in general the longer the treatment is continued (within reasonable limits) the better it is.

The two mixtures are then ready to be combined. The copal-flock-solvent mixture, however, is preferably first allowed to become hardened to permit grinding of the same, after which it is combined with the first-mentioned mixture; but it may be added thereto while in its plastic state. In any event, the combined mixtures are thoroughly mixed and heated at the same moderate temperature for about 15 minutes or until a homogeneous mass is obtained.

Owing to the presence of the common resin solvent in the second mixture, the particles of shellac in the first mixture enter readily and completely into direct and intimate contact with the particles of the second mixture, and vice versa, throughout the entire mass; and this is particularly true of the flock fibers therein, any air and moisture in the one mixture being replaced by the ingredients of the other mixture either in their combined or separate states. The resultant composition is allowed to cool and harden in any form that is convenient or suitable for subsequent use.

The composition described is to be taken merely as an illustration of the application of the discovery. (1,456,369. Emile de Stubner, of New York, N. Y., assignor to Columbia Graphophone Manufacturing Co., of Bridgeport, Conn. Patented May 22, 1923.)

Book Reviews

LEHRBUCH DER CHEMISCHEN TECHNOLOGIE. By *H. Ost.* 13th ed., 1923. 815 pp., 320 illustrations, 11 plates. Max Jänecke, Leipzig. Price, $4.

This well-known text and reference book has undergone but insignificant revision since the appearance of the twelfth edition early in 1922. The twelfth edition, however, contained abundant new material, particularly in connection with explosives, nitrogen compounds, charcoal, illuminating gas and aluminum.

As has been the case heretofore, the emphasis of the subject matter lies in technology rather than chemistry, and with this reservation the book can be heartily recommended to those who want a quick and clear survey of the various chemical processes that comprise modern industry. The subject matter is not particularly logically laid out, as may be seen from the following skeleton table of contents: Production of heat, refrigeration, technology of water, sulphuric acid, salt, sodium sulphate and hydrochloric acid, potash salts, chlorine, nitrogen compounds, fertilizers, clay and alum, explosives, plaster, glass, stoneware, gas lighting, coking of coal, mineral oil, fats, sugar, starch and glucose, cellulose and artificial silk, fermentation industries, dyes, dyeing and printing, brewing, and metallurgy. Despite the fact that the chapters are as unrelated as the volumes in Ahrens' Sammlung, for example, the subject matter is well indexed and abundantly cross-referenced, so that it is easy to find quickly any particular information desired.

The style is clear and readable and the information for the most part up to date. The illustrations, however, might be improved upon, as many appear to have been continued from earlier editions. Thus in the chapter on nitric acid a tourill absorption battery is illustrated, of a type which probably has not been in use for 20 years. In the chapter on the electroylsis of salt, in the same manner, cells of old types

Important Articles in Current Literature

More than fifty industrial, technical or scientific periodicals and trade papers are reviewed regularly by the staff of *Chem. & Met.* The articles listed below have been selected from these publications because they represent the most conspicuous themes in contemporary literature, and consequently should be of considerable interest to our readers. A brief résumé of each article is included in the reference given. Since it is frequently impossible to prepare a satisfactory abstract of an article, this list will enable our readers to keep abreast of current literature and direct their reading to advantage. The magazines reviewed have all been received within a fortnight of our publication date.

DETERMINATION OF FIBER CONTENT OF PAPER. E. O. Reed and R. R. Machmer. Unnumbered pamphlet issued by the Public Printer, Government Printing Office, Washington, D. C. The report summarizes results of the co-operative tests on microscropic analysis of paper made by eleven commercial companies and three government laboratories, showing the accuracy to be expected from such tests.

CORROSION OF GAS MAINS AND METERS. H. E. Williams. Discusses influence of hydrogen sulphide, hydrocyanic acid and carbon dioxide on metals and influence of decreased tar condensation on protection of metals. *Gas Journal*, June 20, 1923, p. 725.

A STUDY OF SOME PHYSICAL LAWS GOVERNING THE CARBONIZATION OF COAL. A. W. Warner. Leading to the determination of how gas coal should be retorted to produce the most economical total of salable constituents. *A. G. A. Monthly*, July, 1923, pp. 431-441.

COKE BREEZE AS FUEL FOR STEAM BOILERS IN GREAT BRITAIN. C. H. S. Tupholme. A discussion of fuel economy in gas plant boiler houses. *Gas Age-Record*, July 7, 1923, pp. 3-6.

COLOR IN RELATION TO DYEING. J. Merritt Matthews. Relation of spectrum of colors to the obtaining of colors desired by mixing dyes. The influence of compounding with grays. *Color Trade Journal*, July, 1923, pp. 1-4.

REPORT ON DRYING OF PAPER. S. B. Jones and W. F. Goldsmith. A paper presented at annual meeting of T.A.P.P.I., which gives excellent suggestions on analysis of drying losses. *Paper Trade Journal*, July 5, 1923, pp. 49-56.

DE VAINS PROCESS OF PAPERMAKING. J. F. Clerc. Detailed description of a process for making chemical pulp from other raw materials than wood. *Paper*, June 13, 1923, pp. 7-8.

THE PROVAN CHEMICAL WORKS OF THE GLASGOW CORPORATION. Anon. A description of a Scottish plant built and operated by a municipal gas works. *Engineering* (London), June 23, 1923, pp. 761-764.

FUEL OIL FOR AIR-FURNACE MELTING. D. I. Dobson. Costs of oil and coal operation compared for this type of furnace. *Iron Age*, July 5, 1923, pp. 5-6.

VITREOUS ENAMELING WITH ELECTRIC HEAT. E. F. Collins. Comparison between metallic resistor and fuel-fired furnaces for application of vitreous enamels. *Journal American Ceramic Society*, July, 1923, pp. 794-798.

PRODUCER GAS FOR BURNING REFRACTORIES. W. D. Richardson. Continuous regenerative kiln necessary for successful burning at high temperatures with producer gas. *Journal American Ceramic Society*, July, 1923, pp. 799-807.

COLD CLEAN ARTIFICIAL GAS AND THE GENERAL PROPERTIES OF GASEOUS FUELS. Alfred E. Blake. This paper will form one of the chapters in a treatise on the glass industry by Prof. Alexander Silverman, University of Pittsburgh. *Journal American Ceramic Society*, July, 1923, pp. 808-830.

are illustrated and no mention is made of the several excellent American cells. On the other hand, there are some illustrations of very new apparatus: a continuous drum filter and Owens' bottle machine, for example.

The paper on which the book is printed is surprisingly variable, both as to quality and color. This has nothing to do with the value of the book, of course, but it is part of the general impression made by it.

The chief value of this work to American chemists would appear to be in connection with brushing up on German while at the same time acquiring general information, or as parallel reading in university courses on industrial chemistry. As a reference book it is not full enough, although certain chapters, such as the one on the fermentation industries, are much fuller than others.

FRED C. ZEISBERG.

New Publications

THE MELLON INSTITUTE OF INDUSTRIAL RESEARCH of the University of Pittsburgh has issued its Tenth Annual Report, by Edward R. Weidlein, director.

THE BUREAU OF CENSUS, Census of Manufactures, 1921, has issued a pamphlet on Brass, Bronze, Copper and Allied Products. Price 5c.

The editorial office of INTERNATIONAL CRITICAL TABLES has prepared for use by the co-operating experts who will assemble the various classes of data for the tables a list of definitions and approved values of general constants of nature, units of measurement and conversion factors. This list has been printed in the form of a pamphlet and will probably be found useful by chemists, physicists and engineers as a convenient and handy source of reference for the above quantities and their logarithms. Copies of this pamphlet can be obtained by sending 25c. in stamps to International Critical Tables, National Research Council, Washington, D. C.

THE ENGINEERING FOUNDATION, 29 West 39th St., New York City, has issued Publication No. 6, which is its report for the year ended Feb. 8, 1923.

THE U. S. DEPARTMENT OF AGRICULTURE has issued Bull. 1152, on Soy and Related Fermentations, by Margaret B. Church; Bull. 1147, on Chemical, Physical and Insecticidal Properties of Arsenicals, by F. C. Cook and N. E. McIndoo; Bull. 1136, Kiln Drying Handbook, by Rolf Thelen; Bull. 1160, Studies of Contact Insecticides, by Charles H. Richardson.

THE DOMINION BUREAU OF STATISTICS, Ottawa, Canada, has issued its Annual Report of the Mineral Production of Canada during the Calendar Year 1921.

Calendar

AMERICAN CERAMIC SOCIETY, summer meeting, Toledo, Detroit and vicinity, Aug. 8 to 11.

AMERICAN CHEMICAL SOCIETY, fall meeting, Milwaukee, Wis., Sept. 10 to 14.

AMERICAN ELECTROCHEMICAL SOCIETY, forty-fourth meeting, Dayton, Ohio, Sept. 27 to 29.

AMERICAN GAS ASSOCIATION, annual convention, Atlantic City, Oct. 15 to 20.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, INC., Ontario and Quebec, Aug. 20 to 31.

AMERICAN MINING CONGRESS, Milwaukee, Wis., Sept. 24 to 27.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS, iron and steel exposition, Buffalo, N. Y., Sept. 24 to 28.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES (NINTH), New York, Sept. 17 to 22.

NATIONAL SAFETY COUNCIL, twelfth annual safety convention, Statler Hotel, Buffalo, Oct. 1 to 5.

Personal

J. B. BEATY has been elected vice-president and secretary of the Nichols Copper Co., New York, with plant in Long Island City.

Dr. CHARLES A. BROWNE, formerly with the Bureau of Chemistry but since 1907 chemist in charge of the New York Sugar Trade Laboratory, has been selected by Secretary Wallace to head the Bureau of Chemistry, United States Department of Agriculture. He will take up his new duties this fall. The office of chief of the Bureau of Chemistry has been vacant since the resignation of Dr. Carl L. Alsburg on July 15, 1921. Walter G. Campbell, who was assistant chief of the bureau in charge of the enforcement of the federal food and drugs act, has been acting chief of the bureau.

Dr. C. F. CHANDLER has been elected to honorary membership in the Society of Chemical Industry, of which he is a past president.

ARTHUR L. DAVIS of the chemical department of the Standard Oil Co. (Indiana) at Wood River, Ill., was in New York last week, attending the grand council meeting of Alpha Chi Sigma, the professional chemical fraternity.

HENRY J. FISHBECK, formerly in charge of the heat-treating department of the Lawrence Aero Engine Co., of New York, is now connected with the metallurgical staff of the Pratt & Whitney Co., of Hartford, Conn.

Dr. KUNO B. HEBERLEIN has left for Europe on business.

T. P. HOFFER has been elected vice-president of the Producers' & Refiners' Corporation, Denver, Colo., in charge of operations. He was formerly president of the Fensland Oil Co., recently taken over by the first-noted organization.

MACLEAN HOUSTON has been elected president and general manager of the Franklin Quality Refining Co., Franklin, Pa. He has been engaged in the oil-refining industry for many years and at one time was manager of the Warren and Titusville, Pa., refineries of the Crew-Levick Co.

E. E. REESER, president of the Barnsdall Oil Co., Kansas City, Kan., has been elected president of the Barnsdall Refining Co., a subsidiary organization, succeeding John L. Gray, resigned.

THE SVEDBERG of the University of Upsala, Sweden, in recognition of his leadership as an international authority on colloid chemistry and his success in the direction of research work at the University of Wisconsin during the past semester, received the honorary degree of Doctor of Science from the University of Wisconsin at commencement.

Industry and Trade

Current News and Market Developments

Summary of the Week

Paper manufacturers appoint committee to investigate conditions arising from threatened export embargo on pulpwood from Canada.

New electrolytic method of manufacturing calcium arsenate reported.

Dr. Charles A. Browne is appointed head of Bureau of Chemistry of U. S. Department of Agriculture.

Testimony in Chemical Foundation suit at Wilmington shows that considerable research work was required to make some of the German patents of value.

China places chlorate of potash on the prohibited list and requires permit on importations.

Report from Rio de Janeiro says that Brazilian Government is aiding in financing a new caustic soda factory.

Official reports place value of dyes seized by the French in the Ruhr last May at 200,000,000 to 300,000,000 francs.

Recent high prices for arsenic have stimulated production in all countries.

Applications for refunds of duties under recent customs ruling will be handled by Treasury officials at Washington.

C. C. Concannon selected to head the Division of Chemistry of the Bureau of Foreign and Domestic Commerce.

American Paper Men Act in Face of Canadian Embargo

Committee Appointed to Protect Interests of Domestic Mills—State Department Treating With Canadian Authorities

RECENT legislation passed by the Canadian Government, which has for its purpose the levying and enforcing an embargo on shipments of pulpwood from Canada to this country, has aroused strong opposition among leading paper interests here. If this embargo is made effective, it will cut off the raw material supply from many pulp mills in this country and also will interfere with the movement of pulpwood from Canadian forests which are now owned by American interests.

It is believed that the Canadian Government has a twofold object putting an embargo on the exportation of this commodity. One of these objects is thought in many quarters to be for the purpose of bargaining to secure traffic or other concessions from the United States, possibly an assured supply of anthracite, and the other to force American companies to inaugurate a better system of fire protection in their timber limits in Canada to help in reforestation.

Canadians Debate Bill

Debate on the proposed law in the Canadian House, as reported in transcripts received in official quarters here, disclosed the consideration given by the Canadian legislators to the possibility of the United States adopting retaliatory measures against a pulpwood embargo, but all the reprisals suggested were outside the provisions of the American tariff. Argument in the Canadian House indicated a feeling that Canada had more to gain than to lose in the event of a pulpwood embargo evoking reprisals and there was a preponderance of sentiment for carrying through the proposals.

The Canadians recognized their dependence upon the United States for anthracite, hardwood and cotton, and the embarrassment it would cause the dominion if the United States should in turn embargo the exportation of those commodities. But, at the same time, they evinced the feeling that the profits which would result from expanding their pulpwood monopoly into a virtual wood pulp monopoly would compensate for these possibilities.

They argued that the cream of the Canadian forests go to the American mills, providing employment for American workmen and profit for the manufacturers and enabling the conservation of this country's supply of pulpwood.

Paper Men Here Act

On Wednesday, July 11, leading American manufacturers of newsprint and of other paper products took action to prevent a shortage in case of a Canadian embargo. A committee of men prominent in the industry was formed to deal with the problems growing out of the situation. It was pointed out that many mills in this country would be seriously affected by the embargo should it be put into effect, as many plants here depend almost entirely on Canada for their pulpwood supply. The paper and printing industries, every branch of which would be affected, have a total product valued at 3 billion dollars a year and employ half a million workmen.

The committee formed will be known as the committee for the perpetuation of the paper industry of the United States. Its chairman is Henry W. Stokes of Philadelphia, affiliated with the York Haven Paper Co. Mr. Stokes is also president of the American Paper and Pulp Association. Hugh P. Baker, executive secretary of the association, will act as secretary for the new committee. Other members include A. G. Paine, Jr., vice-chairman, who is affiliated with the New York & Pennsylvania Paper Co. An executive committee has been formed to expedite the work of the national committee. Colonel W. E. Haskell, vice-president of the International Paper Co., and S. L. Willson, president of the American Writing Paper Co., will serve as members of the executive committee.

Advices from Washington say the State Department has followed developments closely and representations to Canadian authorities may result in an understanding between the two governments. It is pointed out that the action of the Canadian Parliament is merely a delegation of power and is not a mandatory action.

However, there is said to be a strong movement in Canada in favor of the embargo and it is questionable whether the Governor-General will be influenced by this to exercise the grant of authority or will pay heed to the protestations made by our government. From a legal standpoint, it is stated that Canada is within her rights in enforcing the embargo.

C. C. Concannon Appointed to Direct Division of Chemistry of Commerce Bureau

Plans Intensive Development of Service to Industry, Including Series of Monographs on Our Chemical Activities

AFTER acting for the past 8 months as chief of the Division of Chemistry of the Bureau of Foreign and Domestic Commerce, C. C. Concannon has been selected to head this commodity division. Mr. Concannon has been with the Department of Commerce since September, 1922, when he came to Washington as assistant chief of the Chemical Division.

Mr. Concannon is a native of Boston. His early education was obtained in the common schools of that city and at the Boston Latin School. Later he attended Harvard University, where he was graduated in 1911. While at Harvard he specialized in chemistry. On leaving school he sold heavy chemicals in New England for Brewer & Co. of Worcester. Later he became associated with the Takamine Laboratories and took an active part in the management of that enterprise. In connection with that work he spent 2 years in Japan and China.

In the course of his work Mr. Concannon has had close contact with the sale of chemicals both for export and for the domestic market. Incidentally he negotiated, during the war, one of the largest single deals in carbolic acid ever made in this country. As a result of his intimate knowledge of the chemicals and chemical raw materials produced in the Far East, he took a leading part during the war in the movement to draw upon the much-needed supplies of potash, starch, phosporus, iodine and other materials which were available in that part of the world. These sources of supply probably would have been overlooked for a longer period had it not been for Mr. Concannon's activities, as there was no peace-time movement of most of these materials from the Orient to the United States.

Has Taken Important Part in Increasing Activities

Since Mr. Concannon joined the Chemical Division shortly after it was set up, he has had an important hand in directing its activities. He developed a monthly list of dye imports reaching the port of New York. That work has now been expanded to include all articles in paragraphs 27 and 28 of the tariff act. In the near future it is planned to secure this information from all other ports. He pointed out to his superiors the advantages which would accrue from the dispatch to Paris of a special trade commission. This led to the sending of Dr. F. E. Breithut on such a mission.

Mr. Concannon has plans well advanced for increasing the scope of the work done by the Chemical Division. He is establishing numerous contacts with the industry and is seeking ways for extending the usefulness of the service. He hopes to begin in the near future a series of monographs on chemical industries. In each of these monographs the relationships of our industries to the situation in a particular country will be set forth.

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C. C. CONCANNON

Electrolytic Arsenate Process Developed by G. E.

A new electrolytic large-scale method of manufacture of calcium arsenate, the most dependable poison with which to fight the cotton boll weevil, is announced by the research laboratories of the General Electric Co., Schenectady, N. Y. The method is the invention of A. M. Kennedy, engineer of the Alabama Power Co., who did his preliminary work in co-operation with the University of Alabama.

The chief objection to a wider use of calcium arsenate in the campaign against the most destructive of all America's insect pests has been its cost. Not enough could be made by ordinary chemical processes to supply the demand, which grew from 3,000,000 lb. in 1919 to 30,000,000 lb. in 1922, creating an acute shortage of the chemical. Seven hundred million pounds would be needed to supply the entire cotton belt, requiring by the new method 350,000,000 kw.-hr. of energy to manufacture. The process is so new that little can be done this year toward relieving the famine in the insecticide.

This announcement is made by Science Service in a press despatch.

Water-Resisting Glue Made Available for All

Free use by the public of a new water-resisting glue developed at the Forest Products Laboratory at Madison, Wis., has been guaranteed by the United States Patent Office. Any person may obtain the formula by applying to the government for it.

No concern can patent and secure exclusive rights to the glue, which is a perfection of the casein-silicate glue developed during the war, Forest Service officials said. An improvement consisting of the addition of certain copper salts to the old formula give it better strength, water resistance and working properties.

The formula was given to a number of woodworking factories which were using it until they were stopped by threats of suit for infringement by an applicant for a private patent covering the same formula discovered by the government chemists. Upon consideration of the evidence as to priority, however, the U. S. Patent Office granted the patent to the Forest Products Laboratory for dedication to the people of the United States for free use.

To Preserve Old Glass Plant

Under the auspices of historical organizations, an effort is being made to purchase and preserve the ruins of the old Pitkin Glass Works at Manchester, Conn., the first plant of its kind to be established in Connecticut and among the earliest in the United States. The plant was built soon after the Revolutionary War, and until 1830 the factory was operated for its original purpose; a charter was granted to William Pitkin, Elisha Pitkin and Samuel Bishop, giving the sole privilege of making glass in the state for a period of 25 years. For many years past the plant has been a picturesque ruin, and its historic preservation, as now proposed, will make it the first of this character in America to be so sustained.

Cotton Association Funds Attached

Justice McCook of the Supreme Court granted an attachment against the funds of the American Cotton Association pending trial of a suit against the association for $76,000 by the Milner Bureau of Atlanta, Ga. Willis Milner, Jr., and N. Nelson Morey, of the bureau, charge the association failed to fulfill its contract for a convention and campaign fund to fight the boll weevil in the South, thereby causing losses to the bureau, which was engaged to push the enterprise.

New Plant to Produce Borax Products

Announcement is made that the West End Chemical Co. will erect a refinery at Los Angeles, Calif., for the production of borax, boric acid and allied products. The proposed new plant will be financed by a stock issue of $200,000.

Washington News

French Dye Seizure Highly Valued

The first official information as to the value of the dyes and chemicals seized by the French on May 15 in the Ruhr is contained in a cable to the Department of Commerce, which states that 7,000 tons of choice dyestuffs, valued at 200,000,000 to 300,000,000 francs, was seized. The portions due Great Britain, Italy and France under reparations agreements are to be reserved. The remainder is to be sold.

The cablegram also states that the production of industrial alcohol in France for the first 5 months of 1923 was 674,000 hl. During the same period of 1922 production amounted to 542,000 hl.

Heavy chemicals were selling well, but secondary industries are restricting orders, says the cablegram. These purchases are being made by the glass-making, paint, tanning, bleaching and dyestuffs industries.

Nitrate of soda is not selling well, due to bad weather. Stocks at Dunkirk are 12,000 tons. The spot price is 93 francs per 100 kilos. Sales for future delivery total 130,000 tons.

The market for sulphate of ammonia is active, the cablegram states. The factory price is quoted at 85 francs. This low price for sulphate of ammonia is having an adverse affect on cyanamide. Turpentine stocks are very low. The price is 525 francs, with buyers covering well ahead.

Firm Chemical Market in Hungary

According to a report from Vice-Consul Walter S. Reineck, Budapest, Hungary, dated May 17, the tendency of the chemical market was firm and the demand strong. Prices followed foreign quotations, as payment is required in foreign exchange. The gathering of the camomille crop had begun, with a good yield expected. The crop was estimated at 500 quintals (110,200 lb.). Prices of from 80 to 130 crowns were paid for the new crop, but in view of the fact that the dried product could be bought for 250 crowns a kilo, purchases later were discontinued.

China Restricts Imports of Chlorate of Potash

A report from G. C. Hanson, consul at Harbin, states that chlorate of potash will be included in the list of prohibited articles, the importation of which into China after June 1, 1923, can be permitted only under a permit issued by the Minister of War at Peking, according to a notification by the commissioner of Chinese maritime customs at Harbin acting under instructions from the officiating inspector general of customs at Peking.

Home Demand Causes Active Chemical Market in Germany

The chemical market in Germany is brisk, home demand being active and no difficulty experienced in obtaining raw materials, according to the monthly economic cablegram from Berlin to the Department of Commerce.

Production of coal-tar crudes is generally suspended within the occupied area as a result of the occupation, the message states, making necessary large imports from Polish Upper Silesia, Czechoslovakia and Holland. Resumption of production of crudes in the Rhineland is improbable in the near future, as many byproduct ovens have been extinguished, according to the cablegram.

Dye production in the unoccupied area of Germany is considerable, due to the transfer of orders to branch plants there which are now working at full capacity. The message also states that it is said there were heavy transfers of dyes out of the occupied territory before and immediately after the occupation, so that supplies in unoccupied Germany now are large. German coal-tar products are still active in world markets, the cablegram states.

Unofficial Hamburg chemical prices as of July 2 are quoted as, per kilogram: salicylic acid, 132,000 marks; caustic potash, 12,500 marks; ammonium chloride crystal, 12,000 marks.

American Exporters Minor Factors in Paint Trade of Greece

A report to the Department of Commerce from our consul at Athens says that the market for paints and kindred materials in Greece has not been of great importance to American exporters in the past. The principal competitors in this market have been England, France, Germany, the Netherlands and Belgium.

Painting in Greece is done mostly by more or less skilled labor, so that price and quality are equally determining factors for offering paints in this country. Since paints are received from various foreign sources, there are many varieties on the market, all of which are equally appreciated by the consumers. Therefore price consideration is of paramount importance.

Announce Price for Customs Delivery Certificates

The Treasury Department announced last week that certificates of delivery of imported merchandise and certificates of delivery of tax-paid alcohol, as prescribed by the customs regulations, will be salable at the price of 25c. per 100. These certificates are now being printed and customs collectors were instructed to make requisition for them as required.

Calcium Arsenate Indorsed as Check to Boll Weevil

W. D. Hunter and B. R. Coad are joint authors of a bulletin entitled "The Boll-Weevil Problem," just issued by the U. S. Department of Agriculture. In discussing the weevil situation, the bulletin sounds a warning against proprietary preparations and machines for controlling the boll weevil. The state and federal agencies are anxious to help the farmers by means of any new methods which may be discovered. As promptly as possible careful tests are conducted. The Department of Agriculture strongly recommends that farmers exercise due caution in spending money for new boll-weevil remedies. In all cases they should demand evidence of official tests. If anything of value is discovered by the state experiment stations or by the federal department, prompt and widespread notice of the fact will be given the public. So far, in addition to certain cultural methods, only three remedies are under consideration.

In areas where the yield of cotton is high enough to warrant the expense, the calcium arsenate dusting method is heartily indorsed. In Florida a special method of control involving hand removal and destruction of the squares when about two squares per plant are present, followed immediately by a thorough dusting to poison the terminal buds, has been worked out, and it is believed that in other regions of light yields this method could be extensively tested. The molasses-arsenate treatment, which has apparently given results over a wide area, is to be given further official tests.

Treasury Officials to Pass on Duty Refunds

In response to request made by Frank Van Leer, Jr., executive secretary of the National Council of American Importers and Traders, it is announced that applications for refunds of duty filed in accordance with the recent decision of the United States Court of Customs Appeals must come before the Treasury officials at Washington.

New Caustic Soda Plant for Brazil

In a report to the Department of Commerce, Assistant Trade Commissioner M. A. Cremar at Rio de Janeiro states that the Companhia Brasileira de Productos Chimicos is receiving a loan of approximately $120,000 from the Brazilian Government to assist it in erecting a caustic soda factory in the city of Rio de Janeiro. As a guarantee for the loan, the company has pledged its present factory, which has been valued at $235,000. During the year 1922, Brazilian imports of soda products from the United States were as follows: Soda ash, 668,530 lb.; soda bicarbonate, 31,718 lb.; sal soda, 28,500 lb.; and caustic soda, 12,568,935 lb.

Official Estimate Indicates Large Increase in Flaxseed Acreage

Department of Agriculture Issues First Forecast for Season—Probable Yield of Seed Placed at 18,000,000 Bushels

THE AREA sown to flaxseed in the American Northwest, according to the first report for the 1923 season, issued by the Department of Agriculture on Monday, July 9, shows a substantial increase over last year, the preliminary figures amounting to 182.7 per cent of the 1922 total. The area for this season is estimated at 2,285,000 acres, against 1,341,000 acres in the July report of a year ago and 1,308,000 acres in the revised or final report on the 1922 crop. Private preliminary estimates indicated larger plantings and the official report was very much in line with trade expectations. The report was regarded as bearish, for, with favorable growing conditions, the production from the area sown should reach the total of 18,000,000 bu.

Crop 85 per Cent Normal

The condition of the crop is officially placed at 85 per cent of normal, which compares with 87.6 per cent a year ago and a 10-year average of 84.8 per cent. Based on the condition of the crop, the yield per acre is placed at 7.9 bu., comparing with 8 bu. in the July report a year ago and 9.4 bu. in the final for 1922. The final report for 1921 placed the yield per acre at 7 bu.

Total production is estimated at 18,000,000 bu., as against 12,238,000 bu. in 1922. Trade authorities believe that the official figures for the 1922 output are a little high. Actual receipts at leading Northwestern terminals from Sept. 1, 1922, to date amounted to 9,850,000 bu., and it is estimated that close to 750,000 bu. of this total was shipped west from the Argentine. Receipts of domestic seed over the remainder of the crop year will be light. It is estimated that approximately 1,200,000 bu. was retained by farmers for seeding purposes and it is regarded as doubtful whether more than 10,000,000 bu. of domestic seed from last year's production will reach the crushing centers, which would make the 1922 crop approximately 11,200,000 bu., instead of 12,238,000 bu. as estimated by the Department of Agriculture.

High Prices Cause Acreage Gain

High prices for flaxseed brought about the gain in the area planted this season. Record quantities of seed were imported during the past year, in spite of the high tariff, the shipments from the Argentine to the United States since Jan. 1 amounting to 17,712,000 bu. As the United States will consume close to 38,000,000 bu. of flaxseed during the crop year (October-September), it is apparent that importations over the 1923-24 season will have to be large. A crop of 18,000,000 bu., deducting seeding requirements for next year, will provide just enough seed to operate the mills in the Western territory.

Several reasons have been advanced for the high prices that prevailed over the 1922-23 season. In the Northwest the tariff was accepted as the principal reason for the uplift in prices. Operators in seed, removed from the farming districts, believe that world's production during the 1922-23 season fell short by about 10,000,000 bu., for prices paid for seed in the Argentine, as well as India, were very much higher than in the preceding crop year. The extraordinary demand for oil in this country also was a factor.

Last year's final report proved to be very much better than the preliminary estimate because of almost ideal growing conditions over the critical period of the season. However, experience has proved that deterioration generally sets in some time between July 1 and Sept. 30. The following table gives the July 1 estimates for the past 10 years and the final for each year, compiled from statistics issued by the Department of Agriculture:

	July 1, Bu.	Final, Bu.
1914	17,665,000	13,749,000
1915	16,399,000	14,030,000
1916	14,467,000	14,296,000
1917	16,964,000	9,164,000
1918	15,792,000	13,369,000
1919	13,232,000	7,256,000
1920	14,398,000	10,774,000
1921	9,671,000	8,112,000
1922	10,700,000	12,238,000
1923	18,000,000	.....

Canadian Paper Production Running High

A special report issued by the Canadian Pulp and Paper Association states that the exports of newsprint for the month of May amounted to 98,901 tons, compared with 78,378 tons in the previous month. While this figure does not constitute a new record, it is the highest yet recorded, with the exception of the month of March, when the total exports were 113,450 tons.

Of the 98,901 tons exported in May, 98,531 tons was sent to the United States and only 370 tons to other countries, New Zealand taking 343 tons of this amount.

The first 5 months of this year have witnessed a large increase in the newsprint exports over the corresponding period of the last 2 years.

Menthol Crop Estimate

Stocks of menthol on hand in Japan consist of 69 tons, of which 57 tons is available for export to the United States, according to a cablegram from Commercial Attaché Abbott at Tokyo. The present market price is 18 yen per lb. Demand is moderate. It is estimated, the cablegram states, that the 1923 crops will yield 180 tons of 2,000 lb., with 70 per cent available for export.

Development of Poland's Chemical Industry

At the first congress of the Polish chemists held at Warsaw early in May this year it was stated that the chemical industries of Poland had now become more and more independent and that on account of the acquisition of Upper Silesia a most favorable development of these industries could be expected. According to a report submitted by the president of the congress the production of the inorganic chemical industry of the country amounted in 1922 to 70,000 tons of ammonia soda 8,000 tons of caustic soda, 50,000 tons of sulphuric acid, 16,000 tons of superphosphates.

The production of the electrochemical industry amounted to 5,400 tons of nitrogen and cyanogen, while the products of wood distillation amounted to 17,500 tons. The production of colors, started only during the last few years, was stated to average 150 tons per month. On Jan. 1, 1923, there were in operation in the whole country 120 chemical factories giving employment to about 16,000 men. Several large factories, chiefly situated in the western parts of the country, are under construction. In these latter factories the greater part of the capital invested is foreign.

Active Movement in Oils and Fats in Netherlands

There was great activity in the import and export trade of the Netherlands in fats, oils and oil-bearing seeds during the first quarter of the year, especially in the imports of animal fats and the manufacture of vegetable oils from imported materials. The chief explanation lies in the increased activity of the country's margarine concerns, indicated by an increase in exports of margarine from 11,872 metric tons, valued at $2,843,250, in the first quarter of 1922, to exports of 17,628 metric tons, valued at $4,221,750, in the first quarter of 1923. There has been similar activity in the soap and candle factories of the country, while at the same time there has been a marked increase in exports, both in animal fats and vegetable oils.

The chief feature of the trade in animal fats has been the increased use of this class of fats in the margarine trade and in industries generally. The chief feature of the vegetable-oil trade has been the increased production for consumption in the country itself, which is reflected in the import and export trade in oil-bearing seeds. There is considerable significance in the fact that imports of cottonseed oil and other high-grade oils have increased, while imports of peanut oil, soya-bean oil and other oils of lower quality have decreased. This reflects the demand for higher quality oils for margarine manufacture, although an important factor in the change has been the high prices of oils in the Far East.

News Notes

The silica gel process is to be used in the manufacture of petroleum products by the Royal Dutch interests. This announcement has been made by President Miller of the Davison Chemical Co. In his announcement he states that superior product is obtained at a saving of 30c. per barrel over existing methods. The same type of apparatus is used for casinghead gas, sulphur dioxide and the dehydration of air.

Mining manganese ore is becoming one of the important industries of Alabama. Demand for this ore is on the increase and it is said that the profits of mining in the eastern part of that state are very satisfactory. One of the largest mines is at Walnut Grove, where 50 tons of high-grade manganese ore is being taken out daily.

Ammonium nitrate's explosibility is being studied at the Pittsburgh station of the Bureau of Mines in connection with the National Research Council. Its thermal decomposition, the influence of confinement, the influence of density and the effect of nitrous oxide atmospheres upon this salt are being investigated.

Argentina is to build two new oil refineries. Of these, one is to have a capacity of 14,000 bbl. per day and the other will turn out 700 bbl. The larger one, which is to be situated at La Plata, will be provided with an auxiliary plant for the manufacture of oil containers and similar equipment.

Arsenic deposits near Vancouver, B. C., are being investigated by an expert from Europe. The present demand for the rock is such that it is hoped to be able to make use of the large deposits in the vicinity of the Hope and Bridge rivers.

Ozone in air is known to impart properties which make its use in ventilation promising. Its use has also been proposed for bleaching textiles and for sterilization. The Bureau of Mines is co-operating with the Society of Heating and Ventilating Engineers in several problems having to do with the determination of the amount of this gas in the atmosphere and with its effects upon those who breathe it.

A symposium on heat transfer is being arranged for the 1924 spring meeting of the American Chemical Society. Those interested are requested to write to the chairman, W. H. McAdams, M.I.T., Cambridge, Mass., giving provisional title wherever possible.

Present plans for the Chemical Industries Exposition indicate that the exhibits will be divided into more specialized groups than ever before. Thus far exhibits have been planned for the fertilizer industry, insecticide and fungicide industry, basic raw materials and railroads, educational groups by various government departments and the chemical societies, and the dyestuff industry.

The first annual paper industries exposition ever held in Michigan is being arranged to take place at the State Fair Coliseum, Detroit, during the week of March 6-12, 1924. An effort is being made to secure showings from companies in Ohio and Indiana, it being purposed to develop a tri-state organization in the paper industry if it proves feasible.

Asphalt is likely to be produced in large quantities in northern Alabama, according to the opinion of experts. There are several thousand acres of asphalt-bearing rock in this section, according to their story. Already one large company has begun development there and others are reported to be investigating the fields with a similar end in view.

Charles A. Browne to Head Bureau of Chemistry

Well-Known Chemist, Expert in Sugar, Elected to Succeed Alsberg, Who Resigned in 1921

ANNOUNCEMENT of the selection of Dr. Charles A. Browne, of New York, to head the Bureau of Chemistry, United States Department of Agriculture, was made during the past week by Secretary Wallace. Dr. Browne is at present chemist in charge of the New York Sugar Trade Laboratory, Inc., and will not take up his new duties until this fall.

Dr. Browne was formerly with the Bureau of Chemistry, resigning in 1907 to accept the position with the New York Sugar Trade Laboratory, a laboratory which was created for the purpose of serving as an umpire in disputes between wholesale buyers and sellers of sugar arising over differences regarding its chemical analysis. The decision of the laboratory is accepted as final by both parties.

Dr. Browne is an agricultural chemist of wide experience and has done notable work in this field. He is an associate editor of the *Journal of the American Chemical Society* and is the author of many bulletins, papers and text books on chemical subjects. After taking his M.A. degree at Williams he studied at the University of Göttingen, Germany, where in 1902 he received both the M.A. and Ph.D. degrees. He took up his profession as a chemist in New York in 1892, and in 1895-6 was instructor in chemistry at the Pennsylvania State College. After 4 years as assistant chemist at the Pennsylvania Experiment Station, Dr. Browne returned to Germany for 2 years to study sugar chemistry. From 1902 to 1906 he was research chemist at the Louisiana Sugar Experiment Station, New Orleans, and in 1906-7 was chief of the sugar laboratory of the Bureau of Chemistry, resigning to become chemist in charge of the New York Sugar Trade Laboratory, Inc. In 1906 he was United States delegate to the Sixth International Congress of Applied Chemistry at Rome.

The office of chief of the Bureau of Chemistry has been vacant since the resignation of Dr. Carl L. Alsberg, July 15, 1921. Walter G. Campbell, who was assistant chief of the bureau and in charge of the enforcement of the federal food and drugs act, has been acting chief of the bureau. The law requires that the chief of the bureau be a chemist.

Propose Changes for Specifications on Petroleum Products

A meeting was held at Washington last Wednesday, at which experts of the Bureau of Mines and members of the producing and refining branches of the petroleum industry were present. Changes in government specifications for petroleum products were discussed. Different modifications in technical requirements of the several gasoline grades and changes in oils and greases were submitted to the interdepartmental committee, which will render a decision within a few days.

Changes were sought in order that the industry might be relieved of restriction upon outputs which are considered by some producers to be in excess of those necessary for protection of the consumer.

Gypsum Plant for Texas

The U. S. Gypsum Co. of Chicago will build a plant at Sweetwater, Tex., for the manufacture of plaster of paris, cement and other gypsum products, to cost approximately $1,000,000. A large acreage of gypsum deposits, all situated within convenient distance of the site of the proposed plant, has been purchased, and a system of railway will be built to afford transportation of the raw material.

Arsenic Production Stimulated

The world has learned that the United States is in the market for white arsenic. Reports reaching Washington from practically every arsenic-producing country indicate that strenuous efforts are being made to take advantage of the high price now available in this country. As one official put it, the arsenic potentialities of the world have been aroused. He predicts that a surprising amount of this commodity will be found for shipment here during the next year.

Volwiler Says Many Foundation Patents Are Valueless Without Research

His Testimony Fits Kresel's Contention—Choate Defends Valuation —Miller Again on Stand for Cross-Examination

AT THE TIME of going to press the Chemical Foundation is still presenting witnesses in its defence in the suit of the government for the return of the 4,800 patents purchased from the Alien Property Custodian during the war. F. P. Garvan has completed his testimony, Colonel Miller has been on the stand for cross-examination and Joseph H. Choate, Jr., has explained his reasons for placing the valuation of $250,000 upon the patents. The outstanding testimony of the week came from E. H. Volwiler, chief chemist of the Abbott Laboratories, Chicago, maker of synthetic and organic medicinals. One of the most significant decisions of the court during the week is that trade formulas need not be disclosed in the course of court proceedings.

F. P. Garvan brought out the fact in his closing hours on the stand that in arriving at the price fixed on the patents, discussion covering the details of the subject had covered the greater part of a year previous to the sale. The price was said to be about the limit of what the Foundation could offer and what the sellers would take.

Claims Sale Void at Any Price

In answer to the court's question as to whether, if it should be shown the the purchase price for the patents had been adequate, there would still be ground for asking that the sale be set aside, Colonel Anderson, of counsel for the government, said that it is the government's claim that the sale always has been void "on account of the relationship of the parties and their interest." He deems it therefore his duty to endeavor to have the sale set aside, in order to recover the patents into the custody of the United States, to be disposed of as Congress may direct.

The Court asked: "To be set aside on any legal ground available?"

In reply Colonel Anderson said: "Exactly, your honor; the purpose of the suit, stated in another way, is to cancel patents fraudulently obtained; the government being the trustee of all the people."

"Viewed from the German standpoint," Judge Morris, speaking for the court, replied, "I can easily conceive that the price received was highly inadequate, as was testified to by your witness, Dr. Holderman; do you hold that from the American standpoint the high dollar was the ultimate aim to be secured, even considering that the war was not over, and a new war might threaten? If we may not consider that in fixing value, then there is no need of any testimony in this case."

Colonel Anderson: "Your honor, that is the very meat of this case, as I maintain; the principles of law are to be applied to it. I take the position that if the custodian had power to sell so as to get the fair value, he could not be in the position of being both buyer and seller at the same time, or assume all the functions of the government."

The Court: "That is the basic issue here; the defendant says he had a right to take into consideration the future interests of the country. No American purchaser, it would seem, would or could have paid the value, as it is assumed."

An animated discussion between Kresel, of counsel for the defence, and Colonel Anderson followed with regard to whether or not the President had the right to consider the military situation in fixing the price paid for the patents.

When on the stand to explain his reasons for placing the low valuation on the patents, Joseph H. Choate, Jr., named among others the following considerations: difficulty of making accurate description of the patents, the risk of a newer patent rendering any given patent valueless, the factor of "location" or relation of the process to the resources of the locality in which it is to be used, and in this particular instance, the certainty which he felt with regard to litigation following the war.

Volwiler's Testimony Significant

Dr. E. H. Volwiler testified that when America seized the German-owned chemical patents it could not take these patents into laboratories and develop them forthwith into the products promised by the patent formulas. On the contrary, extensive and expensive research was required before some of the most important patents could be rendered useful or salable.

The Abbott Laboratories, for which Dr. Volwiler is chief chemist, is licensed to operate under certain of the most important seized patents, and has, according to the chief chemist, expended tens of thousands of dollars and years of time in deriving the desired products from the patent formulas. The experiments were necessitated by the lack of informative detail in the patents or by the lack of skilled technical knowledge in this country—a situation brought about by the fact of Germany's pre-war monopoly.

Patent Formulas Misleading

In several instances, Dr. Volwiler testified, literal adherence to the patent formulas resulted in impure products. Thus, he said, laboratories had to do considerable investigation before they could market salvarsan and neosalvarsan. Similar difficulty was experienced with patents for cinchophen and neocinchophen, compounds for gout and rheumatism. In the case of cinchophen, he said, $17,000 had been spent in research, and more than $10,000 in equipment, and the experiments occupied a year. The difficulties in the final achievement of neocinchophen, said the expert, were of a like nature, the research lasting 6 months and costing $10,128.

Dr. Volwiler gave similar testimony with regard to acriflavine and proflavine, antiseptic preparations, and said that on novacain his company spent $35,000 in research work to perfect the product.

Judge Anderson Wants Formulas

Asserting that the Abbott Laboratories was one of the original underwriters of and a stockholder in the Chemical Foundation, and had sent the witness here "to attack the very patents under which they hold licenses," Mr. Anderson declared that if he "undertakes to testify the process they used is different from the process of the patent here, while the government does not wish to embarrass anyone if it can help it, we are entitled to know what those differences are."

"It seems to me," said Judge Morris, "that if on a matter which here is of relatively slight moment, in order that he (the witness) may tell whether this patent is workable or not, he is required to disclose, not his secrets but the secrets of his employers, secrets upon which the business of this company is mainly built—as he tells us—it seems to me that the administration of justice could be very readily brought into serious disrepute, where, instead of aiding this administration of justice those engaged in business would desire to escape testimony in every conceivable and possible way."

Miller Again on Stand

When Colonel Thomas W. Miller was on the stand the second time (his direct testimony having been taken by the government several days ago) he testified under cross-examination that the patents would go back to the Germans if American claims against the Germans were met. He admitted that he considered himself a trustee for the enemy owners of the property under his custody. He insisted in adding, however, that he also considered himself a trustee of the American people in their claims against Germany. When the question of the bill of complaint was again raised, he admitted that although he had not read Acting Secretary of State Polk's executive order authorizing the sale of patents to the Foundation, he sold two batches of patents to the Foundation under that order.

In the bill of complaint, which he verified, Colonel Miller alleged he authorized the two conveyances only because certain facts had been withheld from him. He was unable to enumerate these facts, saying he signed the orders as a routine matter in accordance with the procedure he found when he became custodian.

Trade Notes

The import duty on resin going into Salvador has been reduced from 10c. gold to 3c. gold per kilo, according to a report from L. W. Franklin, consul at San Salvador.

The Federal Trade Commission has dismissed the complaint of unfair competition against the Athol Manufacturing Co., of Athol, Mass. This company manufactures a product named "Atholeather."

E. L. Doheny, chairman of the board of Pan-American Petroleum & Transport Co., announced last week that the company's new refinery at Los Angeles, Cal., with daily capacity of 25,000 bbl. of crude oil, will be ready for operation Aug. 1. Pipe lines under construction will be completed by end of month, and ultimate capacity will be 50,000 bbl. daily.

Robert W. Albertson, in charge of the Gratuity Fund of the New York Produce Exchange, has completed 50 years of service with the Exchange. His co-workers and friends presented him with a locket set with diamonds.

J. W. Tuberville of New York and G. W. Covington of Hazelhurst are named as heads of a combination which has bought the plant of the Mississippi Cotton Oil Co. at Jackson, Miss., together with the various branch mills of the company in that state.

J. Philip Bird and Henry J. Haigh have been appointed receivers in equity for the United & Globe Rubber Corp. of Trenton, N. J.

During the fiscal year ended March 31, 1923, according to reports compiled by the Bank of Montreal, the United States exported to Canada merchandise to the value of $540,917,432, and imported from Canada merchandise to the value of $380,347,721.

Henry A. Bade, member of the firm Bade Brothers, manufacturers of paint, 84 Bowery, New York City, died suddenly in Hamburg, Germany, on July 8.

In June the Mexican Petroleum Co. exported 2,723,000 bbl. of oil from Mexico, 238,000 bbl. more than in May, when its exports were 2,485,000 bbl. In addition, the company delivered in the interior of Mexico last month 126,000 bbl. of fuel oil and 190,000 gal. of gasoline.

The Brown Paper Co., Inc., of Monroe, La., organized by pulp and paper manufacturers of Orange, Tex., has awarded the contract for the construction of a $2,000,000 paper mill near West Monroe to the Morton C. Tuttle Co. of Boston, Mass.

The production of calcium cyanamide in Italy during 1922 amounted to 33,422 tons, as against 16,000 tons in 1921. It is estimated that the 1923 consumption may amount to 40,000 tons.

Vegetable Oil Refinery Opens in California

The property of the Western Milling Co., on the inner harbor at Oakland, Calif., has been leased by the McCall Oil Co. and will be operated as a vegetable-oil refinery. The erection of machinery is under way. The company will have an operating floor space of 32,800 sq.ft. and a capacity of 100 tons of cotton seed and 50 tons of flaxseed per day.

The company will operate on cotton seed 7 months of the year, from October to April, inclusive, and the remainder of the year on flaxseed, thus giving continuous operation. The officers of the company are: B. B. McCall, president; James McDonald, vice-president; B. B. McCall, Jr., secretary-treasurer.

British Dye Company Produces New Dyes

A cable from London to the *Wall Street Journal* contains the information that Sir William Alexander told shareholders semi-officially that the British Dyestuff Corporation had placed thirty-five new colors on the British market and had reduced the price of dyes from 3s. 5d. per pound to an average of 2s. 6d. The company set aside £3,500,000 to cover depreciation. Improvement in income amounted to £778,000 over last year. The company is unwilling to concede to Lancashire's demand for permission to import dyes when the British price is more than three times pre-war price. It insists that dye users should support home dyes to prevent recurrence of the 1914 condition.

Ozokerite Trade of Poland

In 1922 the Polish production of ozokerite, or mineral wax, amounted to 430 metric tons, in comparison with 260 tons in 1921, according to statistics compiled by the Polish Ministry of Commerce and Industry. The deposits in Galician Poland are the largest in Europe, although there are reported to be extensive deposits of ozokerite in southern Russia, which are not being developed. A small percentage of the Polish output of ozokerite is consumed locally by a candle factory, but the greater part is exported. Previous to the war America was the greatest consumer of Galician mineral wax, but when the war cut off this supply domestic deposits were greatly developed. More than 400 tons of ozokerite was exported from Poland in 1922. Germany buying 305 tons, Austria 80 tons and Czechoslovakia 31 tons.

Polish Cement Industry Quiet

The annual productive capacity of the Polish cement industry is estimated at 1,044,000 metric tons, but actual production amounts to less than 50 per cent of capacity. Twelve manufacturing establishments were operating during February, employing 3,700 men.

Financial Notes

The Archer-Daniels-Midland Co. has declared a quarterly dividend of $1.75 on its preferred stock, payable Aug. 1. This is the first dividend declared since the recent amalgamation.

The report of the American Thread Co. for the year ended March 31 shows net profit of $1,868,779, as compared with a deficit of $233,033 in the preceding year.

The Amalgamated Sugar Co. on Aug. 1 will pay a dividend of $2 on preferred stock.

The Continental Can Co. has declared $1 quarterly common dividend, payable Aug. 15 to stock of record Aug. 4. This represents an increase of common dividend rate from $3 to $4 per year.

For the year ended Dec. 31, 1922, the consolidated statement of the Davison Chemical Co. and the Davison Sulphur & Phosphate Co. shows a deficit of $502,532 after interest, depreciation and reserves. This compares with a deficit of $411,938 in 1921.

Potassium Nitrate Deposits in Caucasus

Two sources of natural potassium nitrate in the Caucasus are described in a report by Consul John Randolph, Constantinople, prepared from information obtained in August and September, 1922. Both deposits are in the south Caucasus mountain range. The salts have been proved by surface pits to be 80 ft. deep. Analysis showed 3 per cent potassium nitrate. The second deposit contains a large deposit which assays up to 10 per cent. Neither property, however, is being operated.

Approximately 80 miles to the west of this section are well-known deposits of red and yellow ocher, which have been under development for about 25 years. The output of this material, crushed and prepared for market in factories at Batum, has averaged over 36,000,000 lb. a year, used locally in the Caucasus and in Russia.

Larger Export Demand for German Potash

The renewed depreciation of the mark has stimulated purchases of German potash for foreign account. The inland trade also was stimulated by the seasonal reduction in the freight rate. Alsatian competition is making itself felt more and more, according to advices from Germany.

The chemical preparations industry in Germany has revived to a very considerable extent. This has been due largely to the rise of the dollar. The reductions of export duties seem to have had little affect on the situation, as manufacturers regard the decreases as entirely inadequate.

Facts and Figures That Influence Trade in Chemical Products

Market Conditions

Current Prices
Imports and Exports
The Trend of Business

Chemical Consumers Are Buying Mainly To Fill Immediate Wants

Not Much Interest Shown in Forward Positions—Small Lot Buying Irregular but Reaches Seasonal Standards

PRESENT trading in the market for chemicals is largely restricted to buying for immediate requirements. This accounts for the preponderance of small lot orders and the absence of interest in contracts covering deliveries into future months. Reports on the general activity of the market vary, but many hold that total sales are up to seasonal standards and in some cases are above the usual volume for this time of year.

The weighted index for the week shows a loss as compared with that for the preceding week and while the majority of chemicals stood at unchanged levels, it is unquestionably true that prices as a whole show an easy trend, as is to be expected when buying orders diminish and selling pressure increases. Many of the imported chemicals have been under selling pressure for some time, either because spot holdings were unwieldy or because replacement values made it undesirable to hold out for full values on spot stocks. Prussiates of foreign make—both soda and potash—lead the way in price declines.

There is no abatement of interest in calcium arsenate and reports of weevil damage to the cotton crop add to the uncertainty surrounding the arsenate. However, there was no material change in the market and unsold stocks seem to be large enough to take care of buying orders. Arsenic has assumed a quiet position and is not expected to show much life unless an unprecedented demand for arsenate sets in. Prices for arsenic are steadily dropping and world production is reported to be increasing, so it is difficult to form a definite opinion about the level at which futures will finally settle.

Interest in fertilizer chemicals has been increased by the recent placing of contracts for potash salts. Indications point to a larger consumption of fertilizing chemicals in the next season. The president of one company stated that while it has taken very much longer for agricultural chemical industry to adjust itself to conditions brought about by results of war, we can see slow but definite improvement. The annual consumption of agricultural chemicals before the war was approximately 7,500,000 tons and last year was 4,800,000. He stated that this year it is estimated it will reach 6,000,000 and 1924 should find the industry on a normal basis.

Acids

Acetic Acid—Makers report a steady call for most grades with the lower percentages in better than seasonable demand. Glacial is rather quiet but some reports credit improved buying of late. Export demand is slow and official figures for May place export shipments at 126,829 lb. as compared with 728,944 lb. in May last year.

Prussiate of Soda Again Declines — Prussiate of Potash Also Lower—Arsenic Dull and Easier—Bichromates Slow—Imported Cyanide of Soda Weak — Interest in Calcium Arsenate — Alkali Products Move Freely on Contracts — Sal Ammoniac Under Pressure

Prices are on an unchanged basis at $3.38@$3.63 for 28 per cent; $6.78@$7.13 for 56 per cent; $12@$12.78 for glacial.

Boric Acid—Reports were current this week to the effect that a new producing plant would be erected in California. The local market is holding a steady position both with regard to prices and consuming interest. Competition among sellers remains active and quotations are holding at previously quoted levels of 10½@11c. per lb. in bbl. and 11@11½c. per lb. in kegs, these prices applying both to crystals and powdered.

Citric Acid—Fair demand is reported although many sellers state that buying is spasmodic. Prices are openly quoted as low as 51c. per lb. but there has really been no change in the market as holders have been selling below the quoted prices for some time. There has been no change in prices for domestic makes and 49@50c. per lb. is quoted with old orders accounting for the greater part of production.

Formic Acid—The movement has been a little more irregular as different reports indicate some falling off in buying. However, the market in general is said to be well up to normal for this time of year. Domestic acid is largely nominal owing to small stocks and high asking prices. Imported offerings are held at 12@14c. per lb.

Hydrofluoric Acid—Trading is going ahead on a very moderate scale but producing costs are reported to have advanced and this serves to keep prices on a steady level. Quotations are 11@12c. per lb. for 52 per cent in carboys and 13@14c. per lb. for 60 per cent.

Nitric Acid—There is no disposition on the part of producers to change quotations but the tone is weak and according to reports, stocks have accumulated and buyers are able to obtain concessions. Outside of some contract deliveries the movement to consumers is relatively light. Prices are still openly quoted at $4.50@$5 per 100 lb. for 36 deg.; $5@$5.50 per 100 lb. for 40 deg.; $5.25@$5.75 per 100 lb. for 42 deg.

Oxalic Acid—Lower cables recently for shipments have weakened the market for spot goods and have influenced holders of stocks to cut prices in order to move holdings. Offerings on spot were available during the past week at 12¼c. per lb. although in some quarters 12¾c. was asked. Shipments also were quoted at 12¼c. per lb.

Tartaric Acid—Although domestic producers are holding prices at 37¼c. per lb. they are reported to be getting a good share of the business in spite of quotations at 35@36c. per lb. for imported. A fairly good call is reported for both imported and domestic and no price disturbances were noted during the week.

Potash

Bichromate of Potash—This market is practically waiting for consuming trades to open up, as business during the week was of very small proportions. Stocks in sellers' hands, either producers or dealers, are reported to be light but they are more than sufficient to take care of present buying orders. Quotations are unchanged at 11@11½c. per lb., f.o.b. works.

Caustic Potash — Imported caustic potash has held a steady position and 7¼c. per lb. appears to be the lowest price at which sellers will operate. The price ranges from the 7¼c. level up to 8¼c. per lb. with seller and quality given as responsible for the wide difference. Domestic material is holding at 9c. per lb., carlots, at works, and is selling in fair volume.

Carbonate of Potash—Some grades are practically neglected in the present and in no case are there reports of active trading. Limited offerings of certain selections place the market in a susceptible position but with buying orders so irregular, asking prices have

held on a uniform basis. Calcined 80-85 per cent is quoted at 6½@7c. per lb. The 96-98 per cent is offered at 7@7½c. per lb. Hydrated 80-85 per cent also is unchanged at 7½c. per lb.

Chlorate of Potash—Information has been received through government channels to the effect that China had placed chlorate of potash on the prohibited list and would admit importations only under permits. In the local market domestic chlorate is holding steady at 8½c. per lb. at works and upward on a quantity basis. Imported is easy in tone with 7@7½c. per lb. representing prices.

Permanganate of Potash — Cables quote shipments from abroad at 19c. per lb. This has a steadying effect on values in the spot market. Spot quotations are 17@18c. per lb. Odd lots have been offered in the past 2 weeks under the 17c. price and it was possible to shade last week, but most reports agree that in the main, prices have been pretty steady of late.

Prussiate of Potash — Still lower prices were heard this week on yellow prussiate of potash. Spot goods were offered at 30c. per lb. and it appeared as though buyers would have no trouble in taking on round lots at that figure. Shipments also were quoted at 30c. per lb. In contrast to these prices were quotations at 34c. per lb. and even higher, so it is evident that the price range is dependent on seller.

Sodas

Bichromate of Soda — While production has been curtailed as a result of slower buying, stocks are reported to be fairly large and prices are easy with buyers able to secure round lots at 8c. per lb. Consumers are taking fair amounts against contracts but this is a slow time in the textile and tanning trades, which explains the falling off in demand for bichromate. Some resale lots also figure in present trading, although most of fthe selling pressure is said to have come from first hands.

Caustic Soda—Export inquiry is not active and conditions in that respect have not changed during the week. For standard brands 3.25c. per lb. is given as the trading basis f.a.s. and the so-called outside brands are offered at 3.15c. per lb., f.a.s. Very satisfactory conditions are reported as far as the domestic trade in caustic is concerned. Quotations are steady at 3.16½c. per lb., in drums, carlots at works. On ground and flake the asking price is 3.60c. per lb., in drums, at works.

Chlorate of Soda—Some interest has been shown in imported material with sales of moderate sized lots at 6½c. per lb. Some brokers believed that on firm bids 6½c. could be shaded and the market did not look especially strong. Domestic chlorate is moving in a routine way at 6½@6¾c. per lb., at works.

Cyanide of Soda—Imported cyanide is still easy in tone and was offered last week by prominent importers at 20@21c. per lb. This quotation was given for spot and nearby shipments. Weakness in prussiate is said to have caused some falling off in demand for cyanide, especially on the part of dry color makers. Other sellers of cyanide quote up to 22c. per lb. and the range may be considered as depending on seller and on grade.

"Chem. & Met." Weighted Index of Chemical Prices

Base = for 1913-14

This week	171.37
Last week	172.91
July, 1918	277.00
July, 1919	231.00
July, 1920	274.00
July, 1921	148.00
July, 1922	156.00

The week's index number went off to the extent of 154 points on continued weakness in the oils.

Hyposulphite of Soda—Stocks of imported have been reduced by recent buying and a good call also has been felt for domestic makes. Prices are on a stable basis with sellers asking $2.50@$3 per 100 lb. for crystals; $2.75@$3.25 per 100 lb. for pea; and $3@$3.50 per 100 lb. for granular.

Nitrate of Soda—The advance in quotations as made in the preceding week was effective throughout the period. The market has been quiet and trading has been without feature. Very little call is heard for spot material and consumers who are not covered ahead do not seem to be in any hurry to commit themselves. Prices for spot material are given at $2.45 per 100 lb. and futures are holding at previously quoted schedules. Refined nitrate is quiet at 4¼@4½c. per lb. for granulated and 5¼@5½c. per lb. for powdered.

Prussiate of Soda—The downward swing of prices for imported prussiate is still in evidence. Sales of spot goods were put through last week at 13c. per lb. and offerings were available in the latter part of the week at that price. Buyers are interested only when given concessions, and some sellers are willing to make prices attractive in order to move stocks, although some reports stated that low prices for spot goods were influenced by low quotations on shipments. Domestic prussiate was unchanged at 15½c. per lb.

Miscellaneous Chemicals

Arsenic—The spot market for arsenic has become quiet. Occasionally a fair sized lot changes hands but there is no sustained buying. Official figures show that imports in May were slightly in excess of 1,000 tons. Large arrivals from Japan were noted in the current week. Prices for spot goods are quoted at 11¾@12¼c. per lb. Various reports were heard regarding futures. It was stated that goods afloat due before the end of the month were offered at 11c. per lb. On shipments over the last half of the year the prices heard ranged from 9c. to 10c. per lb. and in different quarters it was stated that Oct.-Nov.-Dec. shipment from Japan could be bought at 8c. per lb.

Barium Chloride—There were reports that $80 per ton could be done on imported barium chloride, but sales are said to have been made at $82 and $82@$83 per ton is the general quotation. Barium carbonate was quoted as low as $60 per ton, but this likewise was not a general price and $65 was quoted in other directions.

Bleaching Powder—Steady deliveries are being made against old orders and new business has involved some good sized lots. The market is steady at the recently established price of $1.75 per 100 lb. for carlots at works.

Calcium Arsenate—Reports from the south indicate a wider use of this material and interest has improved with a better call for material. However, the demand is not unusually active and some complaints are heard about failure of contract holders to order out goods. Prices are irregular and vary according to seller with 15@16c. per lb. asked in the majority of cases. It was reported during the week that a new electrolytic process of making arsenate had been perfected and would be a factor later on.

Copper Sulphate—Open quotations for imported goods on spot were 4½c. per lb. and it is possible this figure might be bettered on real business. Shipment prices are nominal in the absence of inquiry but traders say close to 4c. per lb. could be worked on firm bids. Domestic sulphate is holding at 5½c. to 5.60c. per lb.

Phosphorus—Producers are well sold up and the scarcity of stocks for new accounts places the market in a purely nominal position. It is reported that inquiries for spot material have located small lots but that no large lots are available. Increased consumption with production sold on contracts is given as the reason for the present condition of the market.

Sal Ammoniac—Prices for imported are unsettled and are subject to shading. Spot goods could be picked up at 5¾c. per lb. with the general asking price around 6c. per lb. Domestic white granular was quoted at 7@7½c. per lb. f.o.b. works with gray at 8@8½c. per lb.

Alcohol

No further price changes were reported in the market for alcohol. Producers report a fair volume of business in denatured and regarded the undertone as firm. On the special grade, formula No. 1, the trading basis held at 38c. per gal., in drums, and 44c. per gal., in barrels. The completely denatured, 188 proof, settled at 39c. per gal., in drums. Ethyl spirits were maintained on the basis of $4.75 per gal. for the 190 proof, U.S.P. grade. Producers announced no price changes in methanol. The 95 per cent was offered at $1.18 per gal., and the 97 per cent at $1.20 per gal.

Coal-Tar Products

Moderate Call for Benzene for Export—Phenol on Spot Unsettled—Cresylic Offered Freely—Salicylates Easy

THERE was some buying interest in benzene for export and it was reported that several round lots sold for shipment to the Continent. However, supplies appeared plentiful and prices did not steady, smaller producers shading the market in order to attract buyers. The position of gasoline has not improved and this tends to restrict buying of the coal-tar product in domestic motor fuel channels. The creosote market was unchanged. American buyers have not been active abroad, as asking prices for creosote oil in the leading British producing centers have been a little out of range. Advices from Manchester, under recent date, say that sellers have turned down bids at concessions and nominal quotations continue to hold around 9d. per gal., f.o.b. works. Cresylic acid was unsettled on increased competition for business and "open" quotations for spot material could have been shaded in several quarters. Importations of crude cresylic were reported. Phenol on spot also presented some irregularity so far as prices were concerned and scattered lots actually sold at 34@35c. per lb. on the U.S.P. grade. On futures prices were wholly nominal. Salicylic acid was barely steady, but leading producers did not come out with any change in prices. A little export inquiry was in evidence, originating in Japan. Flake naphthalene on spot was about unchanged, with demand slow. On crude naphthalene for shipment from Europe there were offerings of the 76@78 per cent grade at 2.55c. per lb., c.i.f. New York. Solvent naphtha ruled firm on scanty offerings and steady buying interest.

Aniline Oil—The market was inactive, but producers continued to quote on the basis of 16c. per lb., in drums, carlots. The understone in some quarters was barely steady.

Benzaldehyde—Quiet prevailed in the market for benzaldehyde, but stocks were not burdensome and large handlers maintained prices on the round-lot basis of 75c. per lb. for the technical variety, with the customary premium obtaining on the U.S.P grade.

Benzene—Foreign markets appear to offer greater possibilities and, according to traders, some buying has already developed. Several contracts were closed within the past week or so covering round lots for shipment to the Continent, but the terms of sale were not divulged. It was reported that certain traders stood ready to shade the market on large orders. Leading producers continued to name 25c. per gal. as the price for the 90 per cent grade, in tank cars, f.o.b. works. On the pure the bulk quotation stood at 27c. per gal., f.o.b. works.

Beta-Naphthol—The market was unsettled in some quarters and at the close prices ranged from 21@23c. per lb., prompt shipment. Inquiry was slow.

Creosote—British markets for creosote oil were a little high to permit of trading. Asking prices ranged from 9@9½d. per gal., f.o.b. point of shipment, bulk basis.

Cresylic Acid—The prices named here for 97 per cent acid covered a wide range. Competition for business was keen and in some quarters it was said that supplies could have been picked up as low as 90c. per gal., immediate shipment. Some traders were "asking" as high as $1.05 per gal. for spot goods. On contract 90c. could have been shaded.

Naphthalene—During the past week some 2,605 bags of crude naphthalene arrived at New York from foreign ports. The market for crude, according to cable advices received here late in the week, was unsettled on freer offerings. There were sellers of the 76@78 per cent material for shipment from the other side at 2.55c. per lb., c.i.f. New York, while on the lower grades nominal quotations ranged from 2.25@2.35c. per lb., c.i.f. New York. Intermediate makers took hold in a small way only. The spot market for white flake held at 7½@7⅝c. per lb., with trading inactive.

Phenol—Scattered lots of U.S.P. phenol sold on spot at 34@35c. per lb., indicating that the market developed further weakness. The offerings of spot material were not large, but frightened holders were inclined to play safe because of the talk of increasing supplies. Not so long ago phenol sold as high as 54c. per lb. in second-hand channels. On futures the situation was unsettled and producers did not care to name a flat price. But it was reported that favored buyers could have obtained supplies for shipment over the remainder of the year at close to 28c. per lb.

Pyridine—Several shipments came through from Europe, but prices ruled steady at $3.75@$3.85 per gal. On forward business $3.75 could have been shaded.

Salicylic Acid—Inquiry from Japan was reported and in order to secure the business certain producers were credited with talking lower prices. In a general way the market for the U.S.P. grade held at 40c. per lb., but a price of 38c. was heard of during the week.

Solvent Naphtha—Production is sold ahead and prices, so far as leading producers are concerned, are little more than nominal. On contract the market for the water white is holding around 27c., bulk basis, f.o.b.

Swiss Dye Exports Increase

A report from Vice-Consul W. H. Mathee, Zurich, Switzerland, gives data on shipments from that country in 1922. The report states that as compared with the previous year the exports of aniline dyes rose a little, comprising 711,300 kg. with a value of 12,698,000 francs, against 680,600 kg. with a value of 11,303,000 francs in 1921. About 23 per cent of the total exports of aniline dyes went to the United States in 1922. The United States, together with France and England, was the best customer of this industry.

The export trade in alkaloids (832,000 francs) and chemical-pharmaceutical products (717,000 francs) declined as compared with 1921.

The export of synthetic scents, however, the manufacture of which has made rapid strides in Switzerland, totaled 50,000 kg. with a value of 2,282,000 francs, exceeding in bulk the exports of 1921 by 150 per cent.

The exports of chlorates, persulphates, etc., went up close to a half million francs.

Latest Quotations on Industrial Stocks

	Last Week	This Week
Air Reduction	58⅞	57½
Allied Chem. & Dye	65	65½
Allied Chem. & Dye pfd	107	108
Am. Ag. Chem.	10⅜	13½
Am. Ag. Chem. pfd	32¾	*33
American Cotton Oil	4¼	3¾
American Cotton Oil pfd	15	14
Am. Drug Synd.	4⅛	4⅛
Am. Linseed Co.	18½	18½
Am. Linseed pfd.	40⅛	*42
Am. Smelting & Refining	54⅜	53⅛
Am. Smelting & Refining pfd.	94⅛	95⅛
Archer-Daniels Mid. Co., w.i.	28	29
Archer-Daniels Mid. Co. pfd.	98	96
Atlas Powder (new)	55	53
Casein Co. of Am.	*60	*60
Certain-Teed Products	*30.	25
Commercial Solvents	*28	29
Corn Products	117¼	117½
Corn Products pfd.	117	118
Davison Chem.	34½	29½
Dow Chem. Co.	*43	*43
Du Pont de Nemours	111	113
Du Pont de Nemours db.	84	83½
Freeport-Texas Sulphur	10	10½
Glidden Co.	7½	7½
Grasselli Chem.	*130	*130
Grasselli Chem. pfd.	*105	*105
Hercules Powder	*105	105
Hercules Powder pfd.	*104	104
Heyden Chem.	1⅞	1⅞
Int'l Ag. Chem. Co.	2⅜	2½
Int'l Ag. Chem. pfd.	7	8
Int'l Nickel	12	12½
Int'l Nickel pfd.	77½	81
Int'l Salt	77	*77
Mathieson Alkali	39	40½
Merck & Co.	*84	*84
National Lead	108½	111⅝
National Lead pfd.	109½	109½
New Jersey Zinc	147	151
Parke, Davis & Co.	*78	76½
Pennsylvania Salt	*80	*80
Procter & Gamble	*130	*130
Sherwin-Williams	29	28½
Sherwin-Williams pfd.	*102	*101½
Tenn. Copper & Chem.	8⅜	9
Texas Gulf Sulphur	54½	55½
Union Carbide	52	52⅞
United Drug	75½	76
U. S. Industrial Alcohol	45½	44½
U. S. Industrial Alcohol pfd.	*98	*98
Va.-Car. Chem. Co.	7⅜	7½
Va.-Car. Chem. pfd.	22	21

*Nominal. Other quotations based on last sale.

Vegetable Oils and Fats

Crude Cottonseed Lower—Linseed Declines in Dull Market—Coconut Offered Freely—Tallow Declines

THE movement of prices in the market for vegetable oils again favored buyers. The outstanding development last week was the first official report of the season on the northwestern flaxseed acreage and the fact that this showed an increase of 82.7 per cent over last year's plantings created a bearish feeling in linseed oil circles. The weather in the cotton belt generally was favorable and this brought out renewed pressure in cottonseed oil futures. Some trading developed in extra tallow at a decline of ½c. Fish oils were neglected, while reports on the fishing operations were favorable.

Cottonseed Oil—Because of the prospects for a fairly large yield of cotton traders refused to support the oil market and prices again moved downward. Holdings of old crop oil are considered small, but a slump in actual consuming demand brought out some selling pressure in the options and with futures at a sharp discount moderate support from refiners could not sustain prices. July prime summer yellow on the Produce Exchange settled around 10½c. per lb. asked, with September at 10.12c., October at 9.31c. and December at 8.52c. In crude there were offerings of 8¾c., tank cars, f.o.b. mills southeast, and 8¼c. per lb. in Texas. September shipment from Texas was offered at 7½c. per lb., while on October forward nominal quotations ranged from 6¾@7c. per lb. October crude actually sold at 6¾c. per lb. Bleachable oil was offered at 9.80c. per lb., buyers' tanks, f.o.b. New Orleans, equal to 10½c., f.o.b. New York. Cooking oil on spot, New York, was offered at 11c. per lb., in bbl., carload lots, while salad oil could have been picked up for 12¼@12½c. per lb., in bbl. Lard compound was inactive and prices named by first-hands covered a wide range. The lowest price heard was 11¾c. per lb. Live hogs, in Chicago, held around $7.40@$7.80 per 100 lb. Pure lard, in Chicago, settled at 10.90c. for July and 11.12c. for September.

Linseed Oil—Closing prices for linseed oil were from 2@3c. per gal. lower. Following closely upon the publication of the first official crop report on flaxseed, indicating a crop of 18,000,000 bu., against 12,238,000 bu. last season, prices eased off. Actual consumption of oil met with a setback and with the outlook for this season's supply of seed more encouraging than last year buyers refused to take hold. Crushers find themselves better situated as regards stocks of oil and competition for pending business was keen at all times. Spot oil closed nominally at $1.05 per gal., in bbl., carload basis, while on late July deliveries $1.02 per gal. represented the market. August was offered at $1.01@$1.02 per gal., with September at 96c. and October at 89c. A price of 85c. per gal., cooperage basis, was named on November-April contracts. The seed markets were unsettled, the decline in wheat and other grains having almost as much influence on prices as the crop report. (The report of the Department of Agriculture on flaxseed is reviewed elsewhere in this issue.) July seed at Duluth settled around $2.67¾ per bu., while October (new crop) was available at $2.23 per bu. Buenos Aires reported slightly lower prices, but offerings were by no means pressing. The Argentine option market for August shipment seed settled around $1.93 per bu. Shipments from the Argentine to all countries since January 1, 1923, amounted to approximately 36,000,000 bu. The movement of Indian seed also has been large.

China Wood Oil—Sales of china wood oil for prompt shipment from the Pacific coast went through at 21c. per lb., sellers' tanks. Later the price was raised to 22c. asked.

Coconut Oil—Domestic crushers offered Ceylon type oil for shipment over the remainder of the year at 8c. per lb., sellers' tanks, f.o.b. New York. On the coast the market held at 7¾c. nominal, nearby positions, with trading dull. Copra was steady at 4½c. asked, c.i.f. Pacific coast ports.

Corn Oil—Crude corn oil sold down to 7¾c. per lb., sellers' tanks, f.o.b. Chicago, a decline of ½c. for the week. At one time a price of 7½c. was named on August oil. The market was weak in sympathy with cottonseed oil.

Olive Oil—Demand for prime green foots was inactive, but on spot material prices held at 8½@8⅝c. per lb.

Palm Oils—Importations again were liberal and some selling pressure developed, spot prices being under the prevailing cost of import. Lagos was offered at 6¾c. per lb. spot and at 7¼c. for shipment. Niger on spot was offered at 6¾c.

Sesame Oil—Refined was offered at 10¾c. per lb., July shipment from Rotterdam.

Soya Bean Oil—The market was weak on the drop in competing oils. There were calls for bids around 6c. per lb., in bulk, c.i.f. coast.

Fish Oils—No sales came to light in the market for crude menhaden oil. One lot of 1,000 bbl. was offered at 49c., but buyers' ideas were nearer 44c. Fishing was good, all of the boats being out, and the fish are running 5 gal. per thousand. Newfoundland tanked cod oil was unchanged at 65c. per gal.

Oleo Stearine—Several cars sold for export at 9¼c. per lb., an advance of ⅛c.

Tallow and Greases—About 200 drums of extra tallow sold at 6⅝c. per lb., a decline of ¼c. The market was steady at the close. Choice yellow grease held at 6c. per lb.

Miscellaneous Materials

Casein—Importations continue on a liberal scale and prices developed further weakness, closing around 14@15c. per lb. on the lower grades. Demand was quiet.

Glycerine—Scattered business went through in chemically pure glycerine at 16c. per lb., in drums, immediate delivery. Some traders continued to quote 16¼c. per lb., but hinted that this figure might be shaded in round-lot transactions. The dynamite was steady, bids at 14¼c. per lb., carload lots, nearby positions, resulting in no business. Sellers' views on the dynamite grade were nearer 14¾c. per lb., drums included.

Naval Stores—A little buying developed early last week and this steadied prices just a little, turpentine moving on spot at 94c. per gal., as against 93c. a week ago. The demand toward the close was dull and the undertone easier. Export call was lacking. Southern markets were barely steady. In rosins prices held around $5.80 per bbl. Soap-makers and other large consumers showed comparatively little buying interest.

Shellac—The Calcutta market came in lower and this brought out renewed selling here. T.N. sold for nearby delivery as low as 48c. per lb. On spot traders held out for 50@52c. per lb., as to quantity. Demand was dull. Superfine orange settled nominally at 56@57c. per lb. Bleached, bonedry, was offered at 63@65c. per lb., as to position and seller.

White Lead—Another reduction took place in the price named for the metal, leading factors offering pig lead at 6c. per lb., which compares with 6.35c. per lb. a week ago. No additional changes took place in the market for the pigments, but trading was inactive and the undertone easy. Standard dry white lead, in casks, carload lots, closed at 9¼c. per lb. Red lead, dry, in casks, was unchanged at 11¼c. per lb. Litharge, in casks, 10⅜c. per lb.

Lithopone—The demand has been less active, but with no change in basic materials producers held out for 7c. per lb., in bags, carload lots. Imported goods could have been picked up at concessions.

Zinc Oxide—There was a better feeling in the market for the metal, but as business in oxide continued along quiet lines the undertone at the close was barely steady. Rubber manufacturers have been taking hold in a limited way only. Producers quote 8c. per lb. on the lead free, American process. The market for the French process oxide held at 9¾c. per lb., for the red seal grade.

London Tallow Auction

At the regular weekly tallow auction, held in London July 11, the offerings consisted of 885 casks. Sales amounted to only 79 casks and prices realized were unchanged.

Imports at the Port of New York

July 6 to July 12

ACIDS—Cresylic—20 dr., Hull, New York Trust Co.; 40 dr., Liverpool, Order; 14 dr., Rotterdam, Lunham & Moore; 50 dr., Rotterdam, Order. **Formic**—87 dem., Rotterdam, R. W. Greeff & Co. **Hydrofluoric**—1 cyl., Hamburg, Order. **Lactic**—20 cs., Hamburg, Mallinckrodt Chem. Works. **Oxalic**—15 csk., Rotterdam, R. W. Greeff & Co. **Tartaric**—40 bbl., Genoa, Leghorn Trading Co.; 150 bbl., Genoa, L'Appula Soc.; 20 keg, London, Order; 167 csk., Bremen, Equitable Trust Co.; 295 csk., Hamburg, Warren Products Co.

AMMONIUM — 308 csk. nitrate, Hamburg, Kuttroff, Pickhardt & Co.; 71 bbl. chloride, Hamburg, Bank of America; 10 csk. carbonate, Hamburg, Order.

AMYL ACETATE—10 csk., Rotterdam, De Mattia & Co.

ANTIMONY REGULUS — 2,740 cs., Shanghai, Wah Chang Trading Corp.; 250 cs., Shanghai, Irving Bank-Col. Trust Co.; 50 cs., Shanghai, Order; 450 cs., Changsha, Nat'l Bank of Comm.; 50 cs., Hankow, Mitsubishi Soji Kaisha.

ANTIMONY OXIDE — 250 bg., Shanghai, Wah Chang Trading Corp.

ALCOHOL—200 bbl. denatured, Arecibo, C. Esteva; 25 bbl. do., Arecibo, M. Feigel.

ARSENIC—167 cs., Kobe, G. F. Taylor & Co.; 89 cs., Kobe, Frazer & Co.; 200 cs., Kobe, Order; 60 cs., Shanghai, Wah Chang Trading Co.; 200 cs., Kobe, Takata & Co.; 200 cs., Yokohama, Mitsui & Co.

ASBESTOS—1,266 bg., Southampton, W. Crumpton & Co.

BARIUM BINOXIDE—35 dr., Havre, Mallinckrodt Chem. Works.

BARIUM CHLORIDE — 41 csk., Hamburg, E. Suter & Co.

BARYTES—108 csk., Hamburg, A. Klipstein & Co.; 200 bg., Bremen, New York Trust Co.

BLEACHING POWDER—222 dr., Hamburg, E. Suter & Co.; 75 cs., Liverpool, H. Kohnstamm & Co.

BRONZE COLOR—40 cs., Bremen, Baer Bros.; 15 cs., Hamburg, Order; 16 cs., Hamburg, Uhlfelder & Co.

CAMPHOR—150 cs., Shanghai, C. Pfizer & Co.; 100 cs., Kobe, Chase National Bank.

CASEIN—835 bg., Buenos Ayres, International Acceptance Bank; 417 bg., Buenos Aires, Irving Bank-Col. Trust Co.; 1,251 bg., Buenos Aires, Order; 200 bg., Hamburg, Jungmann & Co.; 134 bg., Hamburg, Order; 200 bg., Bordeaux, Equitable Trust Co.; 1,000 bg., Buenos Aires, Kalbfleisch Corp.

CALCIUM CHLORIDE—164 dr., Hamburg, E. Suter & Co.

CHALK—1 lot (bulk), Dunkirk, J. Higman; 1 lot (bulk), Dunkirk, Taintor Trading Co.; 1,000 bg. and 200 bbl., Antwerp, Bankers' Trust Co.; 320 csk. precipitated, Bristol, H. J. Baker & Bros.; 1 lot (bulk), Dunkirk, Kidder, Peabody & Co.

COAL-TAR DISTILLATE—20 dr., Liverpool, Order.

CHEMICALS — 332 pkg., Hamburg, Roessler & Hasslacher Chem. Co.; 62 bbl., Hamburg, Hummel & Robinson; 239 pkg., Hamburg, Jungmann & Co.; 140 csk., Rotterdam, Roessler & Hasslacher Chem. Co.; 429 csk., Rotterdam, Stanley-Doggett, Inc.; 67 pkg., Rotterdam, Order; 27 cs., Havre, G. J. Wallan; 5 cs., Hamburg, Merck & Co.; 5 cs., Hamburg, Morgenstern & Co.; 19 dr., London, A. Penchot, Inc.; 840 bg., Glasgow, E. M. Sergeant & Co.

COAL-TAR PRODUCTS—5 csk., Rotterdam, H. A. Metz & Co.

COLORS—9 csk. aniline, Hamburg, Irving Bank-Col. Trust Co.; 40 csk., Van Dyk brown, Hamburg, C. J. Osborn & Co.; 24 csk., Havre, Irving Bank-Col. Trust Co.; 15 pkg., Havre, Ciba Co.; 12 pkg., Havre, Carbic Color & Chemical Co.; 70 cs., Havre, La Manna, Azema & Farman; 29 csk., Hamburg, H. A. Metz & Co.; 7 csk., Hamburg, Kuttroff, Pickhardt & Co.; 10 csk., Hamburg, E. C. Foster; 4 csk., Hamburg, Franklin Import & Export Co.; 20 bbl. aniline, Genoa, Order; 16 cs. ultramarine, Liverpool, Fezandie & Sperrle.

COPPER SULPHATE—400 csk., Hamburg, Hardy & Ruperti; 20 csk., Bristol, Order.

DYESTUFFS—19 bbl., Havre, Bank of the Manhattan Co.; 4 csk. alizarine, Liverpool, A. Klipstein & Co.; 41 pkg. aniline, Kobe, National Aniline & Chemical Co.; 12 bbl., Genoa, American Exchange Nat'l Bank.

DEXTRINE—75 bg., Rotterdam, Chicago Starch Co.

FULLERS EARTH — 200 bg., London, L. A. Salomon & Bro.

FUSEL OIL—42 dr., Hamburg, American Express Co.; 43 pkg., Hamburg, Order; 14 dr., Dairen, National City Bank.

FUSTIC—1 lot (quantity not specified), Puerto Mexico, H. Triest Co.

GLAUBER SALT—167 bbl., Hamburg, Chemical Nat'l Bank; 250 bg., Hamburg, Order; 50 bbl., Hamburg, A. J. Marcus, Inc.

GLYCERINE—34 csk., Marseilles, Order; 60 csk., Bordeaux, Order.

GUMS—54 cs. damar, Singapore, Chemical National Bank; 150 cs. copal, Singapore, France, Campbell & Darling; 600 bg. arabic, Port Sudan, T. M. Duche & Sons; 563 bg. arabic, Port Sudan, Irving Bank-Col. Trust Co.; 700 bg. arabic, Port Sudan, Anderson & Hillier; 150 bg. arabic, Port Sudan, Caracanda Bros.; 500 bg. arabic, Order; 195 bg. copal, Antwerp, Chemical National Bank; 610 bg. copal, Antwerp, W. Schall & Co.; 150 bg. copal, Antwerp, Chemical National Bank; 105 bg. copal, Singapore, Order; 155 pkg. copal, Singapore, Kidder, Peabody & Co.; 490 bg. karaya, Bombay, Order; 100 bg. tragacanth, Bombay, Order; 108 bg. arabic, Bombay, Order; 210 bg. copal, Yokohama, France, Campbell & Darling; 490 pkg. do., Yokohama, Guaranty Trust Co.; 150 cs. damar and 61 bg. copal, Yokohama, L. C. Gillespie & Sons.

HEMANITE—11,000 tons, Daiquiri, Order.

LOGWOOD—2 lots, Laguna, American Dyewood Co.; 138 bbl. liquid extract, Cape Haitien, Logwood Mfg. Corp.

IRON OXIDE — 20 csk. and 10 kegs, Liverpool, J. H. Rhodes & Co.; 15 csk., Liverpool, Order.

IRON PERCHLORIDE — 30 csk., Hamburg, Order.

MYROBALANS—13,416 pkg., Bombay, Order.

MAGNESIUM — 55 bbl., chloride, Hamburg, Speiden, Whitfield Co.; 36 bbl. fluorosilicate, Hamburg, Order.

MAGNESITE — 330 bg., Hamburg, P. Schleindl; 107 csk. calcined, Rotterdam, H. J. Baker & Bro.; 117 bbl., Rotterdam, Speiden-Whitfield Co.; 12 csk. calcined, Glasgow, Fraser & Co.

MANGROVE BARK—500 bg., Singapore, Order.

NICKEL SULPHATE—42 csk., Bristol, Order.

NAPHTHALENE—300 sk., Hamburg, C. W. Campbell & Co.; 250 bg., Hamburg, Roessler & Hasslacher Chem. Co.; 595 bg., Hamburg, Calco Chemical Co.; 240 bg., London, Order; 1,220 bg., Rotterdam, Lunham & Moore.

OCHER—72 csk., Marseilles, Reichard-Coulston, Inc.; 80 csk., Bordeaux, Order.

OPIUM—56 cs., Salonica, Order; 25 cs., Constantinople, Powers, Weightman & Rosengarten Co.

OILS—Cod—20 csk., St. Johns, E. H. Laing; 200 bbl., Kobe, National Oil Products Co. **China Wood**—100 dr., Hong Kong, Mechanics & Metals Nat'l Bank; 121 csk., Shanghai, Order; 298 csk., Hankow, Jardine, Matheson Co.; 150 csk., Hankow, Order; 760 tons (bulk), Hankow, Spencer Kellogg & Sons; 600 bbl., Hankow, Mitsubishi Shoji Kaisha; 900 bbl., Hankow, Mitsui & Co.; 21 csk., Hankow, L. C. Gillespie & Sons; 600 csk., Hankow, Brown Bros. & Co. **Linseed**—800 tons (bulk), London, Mechanics & Metals National Bank; 200 bbl., Hull, Order; 799 tons (bulk), London, American Linseed Co.; 50 bbl., Rotterdam, Order. **Olive foots**—100 bbl., Palermo, Banca Comm. Italiano; 100 bbl., Patras, G. Baecalos; 200 bbl., Naples, Banca Comm. Ital. **Palm**—619 csk., Hamburg, African & Eastern Trading Co.; 500 csk., Opobo, Niger Co.; 722 csk., Port Harcourt, Niger Co.; 170 csk., Port Harcourt, Thornett & Fehr Co.; 40 csk., Port Harcourt, Comp. Franc de So. Africa; 90 csk., Sapete, Niger Co.; 610 csk., Koko, Niger Co.; 113 csk., Lagos, J. Holt & Co.; 1,237 csk., Lagos, African & Eastern Trading Co.; 205 csk., Iddo, J. Holt & Co.; 300 csk., Iddo, African & Eastern Trading Co.; 57 csk., Rotterdam, Order. **Rapeseed**—100 bbl., Hull, Balfour, Williamson & Co.; 275 bbl., Hull, Order. **Seal**—37 csk., St. Johns, Badcock & Co.. **Sesame**—88 bbl., Rotterdam, J. C. Francesconi & Co.

OIL SEEDS—Linseed—59,106 bg., Rosario, Order; 17,649 bg., Buenos Aires, Order; 49,120 bg., Buenos Aires, Order; 2,629,070 kilos (bulk), Rosario, Kidder, Peabody & Co.; 525,814 kilos (bulk), Rosario, Bank of the Manhattan Co.; 15,046 bg. and 853,135 kilos (bulk), Rosario, Am. Exchange National Bank; 23,002 bg. and 348,737 kilos (bulk), Rosario, Goldman, Sacks & Co.

PARAPHENYLENDIAMIN — 10 cs., Hamburg, Franklin Import & Export Co.

PHOSPHORUS—18 cs., Hamburg, A. J. Marcus, Inc.; 66 cs., Hamburg, Irving Bank-Col. Trust Co.

POTASSIUM SALTS — 200 csk. chlorate, Marseilles, Asia Banking Corp.; 41 dr. caustic, Hamburg, A. Klipstein & Co.; 100 bbl. chlorate, Hamburg, Brown Bros. & Co.; 200 bbl. alum, Hamburg, Order; 46 cs. bromide, Hamburg, Order; 1,000 bg. chlorate, Hamburg, Irving Bank-Col. Trust Co.; 100 bbl. chlorate, Hamburg, Monmouth Chem. Co.; 1,500 csk. chlorate, Hamburg, Mechanics & Metals Nat'l Bank; 6,500 bg. sulphate, Hamburg, Order; 6,500 bg. muriate and a quantity of kainit, Bremen, Potash Importing Corp. of Am.; 5,000 bg. muriate, Hamburg, Potash Importing Corp. of Am.; 240 bbl. nitrate, Hamburg, E. I. Du Pont de Nemours Co.; 350 bbl. chlorate, Marseilles, Asia Banking Corp.; 225 csk. nitrate, Hamburg, Kuttroff, Pickhardt & Co.; 6 csk. sulphocyanide, Liverpool, J. W. Hampton & Co.; 16 keg red prussiate, Liverpool, H. J. Baker & Bros.

PYRIDINE—1 cs., London, Order; 16 dr., Liverpool, U. S. Industrial Alcohol Co.; 6 dr., Liverpool, R. W. Greeff & Co.; 3 dr., Liverpool, Meteor Products Co.; 14 dr., Rotterdam, Lunham & Moore.

QUEBRACHO—10,300 bg., Buenos Aires, Tannin Corp.; 20,046 pkg., Buenos Aires, Tannin Corp.

RADIUM—1 pkg., Hamburg, D. F. Fust.

SHELLAC—67 bg., Hamburg, Kasebier-Chatfield Shellac Co.

SILICON—492 sk., Algiers, Janorier & Co.

SODIUM SALTS—10 cs. carbonate, Lisbon, Foote Mineral Co.; 143 dr. salts, Hamburg, Roessler & Hasslacher Chem. Co.; 194 bbl. sulphate, Hamburg, E. M. Sergeant & Co.; 100 bbl. chlorate, Hamburg, Monmouth Chem. Co.; 162 cs. cyanide, Marseilles, Asia Banking Corp.; 250 csk. sulphate, Hamburg, E. M. Sergeant & Co.; 100 csk. nitrite, Hamburg, E. Suter & Co.

STARCH—250 bg. potato, Rotterdam, J. Wertheimer & Sons; 1,000 bg. potato, Rotterdam, Order.

SUMAC—140 bg., Palermo, Order.

TALC—200 bg., Genoa, C. B. Chrystal & Co.; 200 bg., Genoa, Hammill & Gillespie; 400 bg., Bordeaux, Moore & Munger; 500 bg., Bordeaux, Hammill & Gillespie; 900 bg., Bordeaux, Whittaker, Clark & Daniels; 1,500 bg., Bordeaux, L. A. Salomon & Bros.; 300 bg., Bordeaux, C. B. Chrystal & Co.

TARTAR — 110 bg., Marseilles, Royal Baking Powder Co.; 67 bg., Marseilles, C. Pfizer & Co.; 84 bg., Marseilles, Order; 574 bg., Lisbon, Royal Baking Powder Co.; 575 bg., Lisbon, C. Pfizer & Co.; 619 bg., Buenos Aires, Royal Baking Powder Co.; 195 pkg., Marseilles, Tartar Chem. Works; 190 pkg., Marseilles, C. Pfizer & Co.; 251 bg., Rotterdam, C. Pfizer & Co.; 101 csk., Naples, Tartar Chem. Works.

WAXES—212 bg., bees, Lisbon, Strohmeyer & Arpe; 42 pkg. bees, Lisbon, Order; 223 bg. carnauba, Cara, Lazard Freres Co.; 105 bg. bees, Rio de Janeiro, London & Brazilian Bank; 56 bg. bees, Rio de Janeiro, Order.

WOOL GREASE—7 csk., Breman, Order.

ZINC OXIDE — 100 bbl., Marseilles, Bank of America.

ZINZ OXIDE — 100 bbl., Marseilles, Reichard-Coulston, Inc.

XYLOL—1 cs., London, Order.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetone, drums	lb.	$0.25 –	.25½
Acid, acetic, 28%, bbl.	100 lb.	3.38 –	3.50
Acetic, 56%, bbl.	100 lb.	6.75 –	7.00
Glacial, 99½%, bbl.	100 lb.	12.00 –	12.50
Acetic anhydride, 85%, dr.	lb.	.38 –	....
Boric, bbl.	lb.	.10½–	
Citric, kegs	lb.	.49 –	.52
Formic, 85%	lb.	.14 –	.16
Gallic, tech.	lb.	.45 –	.50
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl.	lb.	.11½–	.12
22% tech., light, bbl.	lb.	.05½–	.06
Muriatic, 18° tanks	100 lb.	.90 –	1.00
Muriatic, 20°, tanks,	100 lb.	1.00 –	1.10
Nitric, 36°, carboys	lb.	.04½–	.05
Nitric, 42°, carboys	lb.	.06 –	.06½
Oleum, 20%, tanks	ton	18.50 –	19.00
Oxalic, crystals, bbl.	lb.	.12½–	.13
Phosphoric, 50% carboys	lb.	.07½–	.08½
Pyrogallic, resublimed	lb.	1.50 –	1.60
Sulphuric, 60°, tanks	ton	11.00 –	11.00
Sulphuric, 60°, drums	ton	13.00 –	14.00
Sulphuric, 66°, tanks	ton	15.00 –	16.00
Sulphuric, 66° drums	ton	20.00 –	21.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.35 –	.35½
Tartaric, domestic, bbl.	lb.	.37½–	....
Tungstic, per lb.	lb.	1.10 –	1.20
Alcohol, butyl, drums, f.o.b. works	lb.	.26 –	.28
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.78 –	....
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.75 –	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl.	gal.	.44 –	...
No. 1, 190 proof, special, dr.	gal.	.38 –	...
No. 1, 188 proof, bbl.	gal.	.45 –	...
No. 1, 188 proof, dr.	gal.	.39 –	...
No. 5, 188 proof, bbl.	gal.	.43 –	...
No. 5, 188 proof, dr.	gal.	.37 –	...
Alum, ammonia, lump, bbl.	lb.	.03½–	.03¾
Potash, lump, bbl.	lb.	.02½–	.03¼
Chrome, lump, potash, bbl.	lb.	.05½–	.05¾
Aluminum sulphate, com., bags	100 lb.	1.50 –	1.65
Iron free bags	lb.	.02½–	.02¾
Aqua ammonia, 26°, drums	lb.	.06½–	.07½
Ammonia, anhydrous, cyl.	lb.	.30 –	.30½
Ammonium carbonate, powd. casks, imported	lb.	.09½–	.10
Ammonium carbonate, powd. domestic, bbl.	lb.	.13 –	.14
Ammonium nitrate, tech., casks	lb.	.10 –	.11
Amyl acetate tech., drums	gal.	4.25 –	4.50
Arsenic, white, powd., bbl.	lb.	.11½–	.12
Arsenic, red, powd., kegs	lb.	.15½–	.16
Barium carbonate, bbl.	ton	60.00 –	65.00
Barium chloride, bbl.	ton	80.00 –	83.00
Barium dioxide, drums	lb.	.18 –	.18½
Barium nitrate, casks	....	.08 –	.08½
Blanc fixe, dry, bbl.	lb.	.04 –	.04½
Bleaching powder, f.o.b. wks., drums	100 lb.	1.75 –	1.90
Spot N. Y. drums	100 lb.	2.20 –	2.30
Borax, bbl.	lb.	.05½–	.05¾
Bromine, cases	lb.	.28 –	.30
Calcium acetate, bags	100 lb.	4.00 –	4.05
Calcium arsenate, dr.	lb.	.14 –	.16½
Calcium carbide, drums	lb.	.05½–	.05¾
Calcium chloride, fused, drums	ton	22.00 –	23.00
Gran. drums	ton	28.00 –	30.00
Calcium phosphate, mono, bbl.	lb.	.06½–	.07
Camphor, cases	lb.	.86 –	.88
Carbon bisulphide, drums	lb.	.07 –	.07½
Carbon tetrachloride, drums	lb.	.09½–	.10
Chalk, precip.—domestic, light, bbl.	lb.	.04½–	.04¾
Domestic, heavy, bbl.	lb.	.03½–	.03¾
Imported, light, bbl.	lb.	.04½–	.05
Chlorine, liquid, tanks, wks.	lb.	.05½–	.05¾
Cylinders, 100 lb., wks.	lb.	.06 –	.06½
Cylinders, 100 lb., spot	lb.	.09 –	....
Chloroform, tech., drums	lb.	.35 –	.38
Cobalt oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	20.00 –	21.00
Copper carbonate, bbl.	lb.	.19 –	.20
Copper cyanide, drums	lb.	.47 –	.50
Coppersulphate, dom., bbl.,	100 lb.	5.50 –	5 75
Imp. bbl.	100 lb.	4.50 –	4.75
Cream of tartar, bbl.	lb.	.25½–	.26½
Epsom salt, dom., tech., bbl.	100 lb.	1.75 –	2.00
Epsom salt imp., tech., bags	100 lb.	.90 –	1.00
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.00 –	2.50
Ether, U.S.P., resale, dr.	lb.	.13 –	.15
Ethyl acetate, 85%, drums	gal.	.80 –	.81
Ethyl acetate, pure (acetic ether, 98% to 100%)	gal.	.95 –	1.00
Formaldehyde, 40%, bbl.	lb.	$0.14 –	$0.14½
Fullers earth—imp., powd., net	ton	30.00 –	32.00
Fusel oil, ref., drums	gal.	.... –	....
Fusel oil, crude, drums	gal.	3.75 –	4.00
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Glaubers salt, imp., bags	100 lb.	.90 –	.95
Glycerine, c.p., drums extra	lb.	.16 –	.16½
Glycerine, dynamite, drums	lb.	.14½–	....
Glycerine, crude 80%, loose	lb	.10 –	....
Iodine, resublimed	lb.	4.55 –	4.65
Iron oxide, red, casks	lb.	.12 –	.18
Lead:			
White, basic carbonate, dry, casks	lb.	.09½	.09¼
White, basic sulphate, casks	lb.	.08½–	.09
White, in oil, kegs	lb.	.11½–	.11½
Red, dry, casks	lb.	.10½–	.11½
Red, in oil, kegs	lb.	.13 -	.14½
Lead acetate, white crys., bbl.	lb.	.14 -	.14½
Brown, broken, casks	lb.	.13 –	.13½
Lead arsenate, powd., bbl.	lb.	.23 –	.24
Lime-Hydrated, bbl.	per ton	16.80 –	17.00
Lime, Lump, bbl.	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.10½–	.10½
Lithophone, bags	lb.	.07 –	.07½
in bbl.	lb.	.07½–	.07¾
Magnesium carb., tech., bags	lb.	.08½–	.08½
Methanol, 95%, bbl.	gal.	1.18 –	1.20
Methanol, 97%, bbl.	gal.	1.20 –	1.22
Nickel salt, double, bbl.	lb.	.10½–	....
Nickel salts, single, bbl.	lb.	.11½–	....
Phosgene	....	.60 –	.75
Phosphorus, red, cases	lb.	.... –	....
Phosphorus, yellow, cases	lb.	.35 –	.40
Potassium bichromate, casks	lb.	.11 –	.11½
Potassium bromide, gran., bbl.	lb.	.19 –	.20
Potassium carbonate, 80-85%, calcined, casks	lb.	.06½–	.06½
Potassium chlorate, powd.	lb.	.07½–	.08½
Potassium cyanide, drums	lb.	.47 –	.52
Potassium, first sorts, cask	lb.	.08	.08½
Potassium hydroxide (caustic potash) drums	lb.	.07½–	.09
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.06½–	.07½
Potassium permanganate, drums	lb.	.16½–	.17½
Potassium prussiate, red, casks	lb.	.65 –	.67
Potassium prussiate, yellow, casks	lb.	.30 –	.33
Salammoniac, white, gran., casks, imported	lb.	.05½–	.06
Salammoniac, white, gran., bbl., domestic	lb.	.07½–	.07½
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20	1.40
Salt cake (bulk)	ton	26.00 –	28.00
Soda ash, light, 58% flat, bags, contract	100 lb.	1.45 –	1.50
Soda ash, light, 58%, flat, bags, resale	100 lb.	1.70 –	1. 75
Soda ash, dense, bags, contract, basis 58%	100 lb.	1.51 –	....
Soda ash, dense, in bags, resale	100 lb.	1.85 –	1.90
Soda, caustic, 76%, solid, drums	100 lb.	3.16½–	....
Soda, caustic, ground and flake, contracts	100 lb.	3.60 –	3.85
Soda, caustic, ground and flake, resale	100 lb.	3.72½–	....
Sodium acetate, works, bags	lb.	.05½–	.05¾
Sodium bicarbonate, bbl.	100 lb.	2.00 –	2.50
Sodium bichromate, casks	lb.	.08 –	.08½
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½–	.04½
Sodium chlorate, kegs	lb.	.06½–	.07
Sodium chloride	long ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.20 –	.22½
Sodium fluoride, bbl.	lb.	$0.08½–	$0.10½
Sodium hyposulphite, bbl.	lb.	.02½–	.03
Sodium nitrite, casks	lb.	.07½–	.07½
Sodium peroxide, powd., cases	lb.	.28 –	.30
Sodium phosphate, dibasic, bbl.	lb.	.03½–	.04
Sodium prussiate, yel. drums	lb.	.13½–	.15½
Sodium salicylic, drums	lb.	.47 –	.52
Sodium silicate (40°, drums)	100 lb.	.75 –	1.15
Sodium silicate (60°, drums)	100 lb.	1.75 –	2.00
Sodium sulphide, fused, 60-62% drums	lb.	.04½–	.04½
Sodium sulphite, crys., bbl.	lb.	.03½–	.03¾
Strontium nitrate, powd., bbl.	lb.	.12½–	.13
Sulphur chloride, yel drums	lb.	.04½–	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bag	100 lb.	2.25 –	2.35
Sulphur, roll, bag	100 lb.	2.00 –	2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 –	.08½
Talc—imported, bags	ton	30.00 –	40.00
Talc—domestic powd., bags	ton	18.00 –	25.00
Tin bichloride, bbl.	lb.	.11½–	.12
Tin oxide, bbl.	lb.	.47 –	....
Tin crystals, bbl.	lb.	.30½–	.31
Zinc carbonate, bags	lb.	.14 –	.14½
Zinc chloride, gran, bbl.	lb.	.06½–	.06½
Zinc cyanide, drums	lb.	.37 –	.38
Zinc oxide, , lead free, bbl.	lb.	.08 –	.08½
5% lead sulphate, bags	lb.	.07½–	.....
10 to 35 % lead sulphate, bags	lb.	.07 –	.....
French, red seal, bags	lb.	.09½–	.....
French, green seal, bags	lb.	.10½–	.....
French, white seal, bbl.	lb.	.12 –	.....
Zinc sulphate, bbl.	100 lb.	2.50 –	3.00

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.62 –	$0.75
Alpha-naphthol, ref., bbl.	lb.	.70 –	.80
Alpha-naphthylamine, bbl.	lb.	.35 –	37
Aniline oil, drums	lb.	.16 –	.16½
Aniline salts, bbl.	lb.	.23 –	.24
Anthracene, 80%, drums	lb.	.75 –	1.00
Anthracene, 80%, imp., drums, duty paid	lb.	.70 –	.75
Anthraquinone, 25%, paste, drums	lb.	.70 –	.75
Benzaldehyde U.S.P., carboys	lb.	1.40 –	1.45
tech, drums	lb	75	.....
Benzene, pure, water-white, tanks and drums	gal.	.27 –	.32
Benzene, 90%, tanks & drums	gal.	.25 –	.30
Benzene, 90%, drums, resale	gal.	.28 –	.32
Benzidine base, bbl.	lb.	.80 –	.85
Benzidine sulphate, bbl.	lb.	.70 –	.75
Benzoic acid, U.S.P., kegs	lb.	.75 –	80
Benzoate of soda, U.S.P., bbl.	lb.	.57 –	.65
Benzyl chloride, 95-97%, ref., drums	lb.	.45 –	....
Benzyl chloride, tech., drums	lb	.30 –	.35
Beta-naphthol, tech., bbl.	lb.	.21 –	.22
Beta-naphthylamine, tech.	lb.	.80 –	.90
Cresol, U.S.P., drums	lb.	.25 –	.29
Ortho-cresol, drums	lb.	.28 –	.32
Creaylic acid, 97%, resale, drums	gal.	.90 –	1.00
95-97%, drums, resale	gal.	.85 –	.90
Dichlorbenzene, drums	lb.	.07 –	.09
Diethylaniline, drums	lb.	.50 –	.60
Dimethylaniline, drums	lb.	.41 –	.42
Dinitrobenzene, bbl.	lb.	.19 –	.20
Dinitroclorbenzenee bbl.	lb.	.22 –	.23
Dinitronaphthalen, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluene, bbl.	lb.	.20 –	.22
Dip oil, 25%, drums	gal.	.25 –	.30
Diphenylamine, bbl.	lb.	.50 –	.52
H-acid, bbl.	lb.	.75 –	.80
Meta-phenylenediamine, bbl.	lb.	1.00 –	1.05
Michlers ketone, bbl.	lb.	3.00 –	3.50
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	.95 –	1.10
Naphthalene, flake, bbl.	lb.	.07½–	.07½
Naphthalene, balls, bbl.	lb.	.07½–	.08
Naphthionate of soda, bbl.	lb.	.58 –	.65
Naphthionic acid, crude, bbl.	lb.	.55 –	.60
Nitrobenzene, drums	lb.	.10 –	.12
Nitro-naphthalene, bbl.	lb.	.30 –	.35
Nitro-toluene, drums	lb.	.13½–	.14½
N-W acid, bbl.	lb.	1.25 –	1.30
Ortho-amidophenol, kegs	lb.	2.30 –	2.35
Ortho-dichlorbenzene, drums	lb.	.17 –	.20
Ortho-nitrophenol, bbl.	lb.	.90 –	.92
Ortho-nitrotoluene, drums	lb.	.10 –	.12
Ortho-toluidine, bbl.	lb.	.13½–	.14
Para-amidophenol, base, kegs	lb.	1.20 –	1.30
Para-amidophenol, HCl, kegs	lb.	1.25 –	1.35
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Paranitroaniline, bbl.	lb.	.68 –	.72
Para-nitrotoluene, bbl.	lb.	.60 –	.65
Para-phenylenediamine, bbl.	lb.	1.45 –	1.50
Para-toluidine, bbl	lb.	.90 –	.95
Phthalic anhydride, bbl.	lb.	.35 –	.38
Phenol, U.S.P., dr.	lb.	.34 –	.35
Picric acid, bbl.	lb.	.20 –	.22
Pyridine, dom., drums	gal.	nominal	

Pyridine, imp., drums	gal.	$3.75 –	$4.00
Resorcinol, tech., kegs	lb.	1.50 –	1.60
Resorcinol, pure, kegs	lb.	2.25 –	....
R-salt, bbl.	lb.	.55 –	.60
Salicylic acid, tech., bbl.	lb.	.37 –	.42
Salicylic acid, U.SP., bbl.	lb.	.40 –	....
Solvent napthha, water-white, tanks	gal.	.27 –	....
Crude, tanks	gal.	.24 –	....
Sulphanilic acid, crude, bbl.	lb.	.18 –	.20
Thiocarbanilide, kegs	lb.	.35 –	.38
Toluidine, kegs	lb.	1.20 –	1.30
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars	gal.	.30 –	.32
Toluene, drums	gal.	.34 –	.36
Xylidines drums	lb.	.49 –	.50
Xylene, pure, drums	gal.	.65 –	.90
Xylene, com., drums	gal.	.37 –	.....
Xylene, com., tanks	gal.	.32 –	.....

Naval Stores

Rosin B-D, bbl. 280 lb.		$5.80 –	....
Rosin E-I, bbl. 280 lb.		5.85 –	....
Rosin K-N, bbl. 280 lb.		6.00 –	6.10
Rosin W.G.-W.W., bbl. 280 lb.		6.25 –	7.25
Wood rosin, bbl. 280 lb.		5.90 –	6.00
Turpentine, spirits of, bbl.	gal.	.93 –	....
Wood, steam dist., bbl.	gal.	.84 –	....
Wood, dest. dist., bbl.	gal.	.62 –	.63
Pine tar pitch, bbl. 200 lb.		..... –	6.00
Tar, kiln burned, bbl. 500 lb.		..... –	13.00
Retort tar, bbl. 500 lb.		..... –	12.00
Rosin oil, first run, bbl.	gal.	.42 –	.....
Rosin oil, second run, bbl.	gal.	.45 –	.....
Rosin oil, third run, bbl.	gal.	.50 –	.....
Pine oil, steam dist.	gal.	.70 –	.....
Pine oil, pure, dest. dist.	gal.	.65 –	.....
Pine tar oil, ref.	gal.	.48 –	.....
Pine tar oil, crude, tanks t.o.b Jacksonville, Fla.	gal.	.32 –	.32½
Pine tar oil, double ref., bbl.	gal.	..... –	.75
Pine tar, ref., thin, bbl.	gal.	..... –	.25
Pinewood creosote, ref., bbl.	gal.	..... –	.52

Animal Oils and Fats

Degras, bbl.	lb.	$0.03½ –	$0.04½
Grease, yellow, bbl.	lb.	.06 –	.06½
Lard oil, Extra No. 1, bbl.	gal.	.90 –	.92
Neatsfootoil 20 deg. bbl.	gal.	1.30 –	....
No. 1, bbl.	gal.	.92 –	.94
Oleo Stearine		.09½ –	....
Red oil, distilled, d.p. bbl.	lb.	.09 –	.09½
Saponified, bbl.	lb.	.09 –	.09½
Tallow, extra, loose	lb.	.06½ –	.....
Tallow oil, acidless, bbl.	gal.	.94 –	.96

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.14 –	.....
Castor oil, No. 1, bbl.	lb.	.14½ –	.....
Chinawood oil, bbl.	lb.	.25 –	.25½
Coconut oil, Ceylon, bbl.	lb.	.09 –	.09½
Ceylon, tanks, N.Y.	lb.	.08 –	.08½
Coconut oil, Cochin, bbl.	lb.	.09½ –	.09½
Corn oil, crude, bbl.	lb.	.09½ –	.10
Crude, tanks, (f.o.b. mill)	lb.	.07½ –	.07½
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.08½ –	.....
Summer yellow, bbl.	lb.	.10½ –	.11
Winter yellow, bbl.	lb.	.12½ –	.12½
Linseed oil, raw, car lots, bbl.	gal.	1.05 –	.....
Raw, tank cars (dom.)	gal.	1.00 –	.....
Boiled, cars, bbl. (dom.)	gal.	1.07 –	.....
Olive oil, denatured, bbl.	gal.	1.05 –	1.10
Sulphur, (foots) bbl.	lb.	.08½ –	.08½
Palm, Lagos, casks	lb.	.06½ –	.07
Niger casks	lb.	.06½ –	.....
Palm kernel, bbl.	lb.	.08½ –	.08½
Peanut oil, crude, tanks (mill)	lb.	.11 –	.....
Peanut oil, refined, bbl.	lb.	.15 –	.15½
Perilla, bbl.	lb.	.15½ –	.15½
Rapeseed oil, refined, bbl.	gal.	.76½ –	.77½
Rapeseed oil, blown, bbl.	gal.	.82 –	.....
Sesame, bbl.	lb.	.11½ –	.11½
Soya bean (Manchurian), bbl.	lb.	.10½ –	.11
Tank, f.o.b. Pacific coast	lb.	.09 –	.....
Tank, (f.o.b. N.Y.)	lb.	.09½ –	.....

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.65 –	.....
Menhaden, light pressed, bbl.	gal.	.76 –	.....
White bleached, bbl.	gal.	.76 –	.....
Blown, bbl.	gal.	.82 –	.....
Crude, tanks (f.o.b. factory)	gal.	.45 –	.50
Whale No. 1 crude, tanks, coast	lb.	..... –	.....
Winter, natural, bbl.	gal.	.76 –	.78
Winter, bleached, bbl.	gal.	.79 –	.80

Oil Cake and Meal

Coconut cake, bags	ton	$26.00 –	$28.00
Copra, sun dried, bags, (c.i.f.)	lb.	.05 –	....
Sun dried Pacific coast	lb.	.04½ –	.04½
Cottonseed meal, f.o.b. mills	ton	38.00 –	....
Linseed cake, bags	ton	36.00 –	....
Linseed meal, bags	ton	38.00 –	....

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.45 –	$0.50
Albumen, egg, tech, kegs	lb.	.95 –	.97
Cochneal, bags	lb.	.33 –	.35
Cutch, Borneo, bales	lb.	.04½ –	.04½
Cutch, Rangoon, bales	lb.	.13 –	.13½
Dextrine, corn, bags 100 lb.		3.79 –	4.06
Dextrine, gum, bags 100 lb.		4.14 –	4.34
Divi-divi, bags	ton	38.00 –	39.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Logwood, sticks	ton	26.00 –	30.00
Logwood, chips, bags	lb.	.02½ –	.03½
Sumac, leaves, Sicily, bags	ton	70.00 –	72.00
Sumac, ground, bags	ton	$65.00 –	$67.00
Sumac, domestic, bags	ton	40.00 –	42.00
Starch, corn, bags 100 lb.		3.22 –	3.49
Tapioca flour, bags	lb.	.07 –	.07½

Extracts

Archil, cone., bbl.	lb.	$0.18 –	$0.22
Chestnut, 25% tannin, tanks	lb.	.02 –	.03
Divi-divi, 25% tannin, bbl.	lb.	.04 –	.05
Fustic, crystals, bbl.	lb.	.20 –	.22
Fustic, liquid, 42°, bbl.	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.08 –	.09
Hematine crys., bbl.	lb.	.14 –	.18
Hemlock, 25% tannin, bbl.	lb.	.03½ –	.04½
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl.	lb.	.09½ –	.10½
Logwood, crys., bbl.	lb.	.17 –	.18
Logwood, liq., 51°, bbl.	lb.	.08½ –	.09
Quebracho, solid, 65% tannin, bbl.	lb.	.04½ –	.05
Sumac, dom., 51°, bbl.	lb.	.06½ –	.07

Dry Colors

Blacks–Carbongas, bags, f.o.b. works, spot	lb.	$0.18 –	$0.22
Lampblack, bbl.	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Bronze, bbl.	lb.	.55 –	.60
Prussian, bbl.	lb.	.55 –	.60
Ultramarine, bbl.	lb.	.08 –	.35
Browns, Sienna, Ital., bbl.	lb.	.06 –	.14
Sienna, Domestic, bbl.	lb.	.03½ –	.04
Umber, Turkey, bbl.	lb.	.04 –	.04½
Greens–Chrome, C.P. Light, bbl.	lb.	.32 –	.34
Chrome, commercial, bbl.	lb.	.12 –	.12½
Paris, bulk	lb.	.25 –	.28
Reds, Carmine No. 40, tins	lb.	4.50 –	4.70
Oxide red, casks	lb.	.10 –	.14
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl.	lb.	1.25 –	1.28
Yellow, Chrome, C.P. bbls.	lb.	.20 –	.21
Ocher, French, casks	lb.	.02½ –	.03

Waxes

Bayberry, bbl.	lb.	$0.30 –	$0.32
Beeswax, crude, bags	lb.	.21 –	.21½
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candellila, bags	lb.	.20 –	.21
Carnaubn, No. 1, bags	lb.	.42 –	.43
No. 2, North Country, bags	lb.	.23 –	.23½
No. 3, North Country, bags	lb.	.17½ –	.18½
Japan, cases	lb.	.16 –	.16½
Montan, crude, bags	lb.	.04½ –	.04½
Paraffine, crude, match, 105-110 m.p.	lb.	.04 –	.04½
Crude, scale 124-126 m.p., bags	lb.	.02½ –	.03
Ref., 118-120 m.p., bags	lb.	.03 –	.03½
Ref., 125 m.p., bags	lb.	.03½ –	.03½
Ref. 128-130 m.p., bags	lb.	.03½ –	.03
Ref., 133-135 m.p., bags	lb.	.04½ –	.04½
Ref., 135-137 m.p., bags	lb.	.05½ –	.05½
Stearic acid, agle pressed, bags	lb.	.12½ –	.13
Double pressed, bags	lb.	.13½ –	.13½
Triple pressed, bags	lb.	.14½ –	.14½

Fertilizers

Ammonium sulphate, bulk, f.o.b. works 100 lb.		$3.20 –	$3.25
F.a.s. double bags 100 lb.		3.55 –	3.65
Blood, dried, bulk	unit	4.00 –	.....
Bone, raw, 3 and 50, ground	ton	27.00 –	30.00
Fish scrap, dom., dried, wks.	unit	3.75 –	.....
Nitrate of soda, bags 100 lb.		2.45 –	2.52½
Tankage, high grade, f.o.b. Chicago	unit	3.40 –	3.50
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	$4.00 –	$4.50
Tennessee, 78-80%	ton	8.00 –	8.25
Potassium muriate, 80%, bags	ton	34.55 –	.....
Potassium sulphate, bags basis 90%	ton	43.67 –	.....
Double manure salt	ton	25.72 –	.....
Kainit	ton	7.22 –	.....

Crude Rubber

Para—Upriver fine	lb.	$0.26½ –	.....
Upriver coarse	lb.	.24 –	.....
Upriver caucho ball	lb.	.24½ –	.....
Plantation—First latex crepe	lb.	.25 –	.....
Ribbed smoked sheets	lb.	.25 –	.....
Brown crepe, thin, clean	lb.	.24 –	.....
Amber crepe No. 1	lb.	.24½ –	.....

Gums

Copal, Congo, amber, bags	lb.	$0.12 –	$0.13
East Indian, bold, bags	lb.	.23 –	.23½
Manila, pale, bags	lb.	.20 –	.20½
Pontinak, No. 1 bags	lb.	.20 –	.20½
Damar, Batavia, cases	lb.	.27½ –	.28
Singapore, No. 1, cases	lb.	.32 –	.33
Singapore, No. 2, cases	lb.	.21½ –	.22
Kauri, No. 1, cases	lb.	.65 –	.67
Ordinary chips, cases	lb.	.21 –	.22
Manjak, Barbados, bags	lb.	.09 –	.09½

Shellac

Shellac, orange fine, bags	lb.	$0.55 –	.....
Orange superfine, bags	lb.	.57 –	.....
A. C. garnet, bags	lb.	.56 –	.....
Bleached, bonedry	lb.	.64 –	.....
Bleached, fresh	lb.	.51 –	.52
T. N., bags	lb.	.50 –	.....

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh. ton	$500.00 –	.....
Asbestos, shingle, f.o.b., Quebec	sh. ton	$65.00 –	$85.00
Asbestos, cement, f.o.b., Quebec	sh. ton	20.00 –	25.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	16.00 –	20.00
Barytes, grd., off-color, f.o.b. mills bulk	net ton	13.00 –	15.00
Barytes, floated, f.o.b. St. Louis, bbl.	net ton	28.00 –	.....
Barytes, crude f.o.b. mines, bulk	net ton	10.00 –	11.00
Casein, bbl., tech.	lb.	.14½ –	.16½
China clay (kaolin) crude, f.o.b. Ga.	net ton	7.00 –	9.00
Washed, f.o.b. Ga.	net ton	8.00 –	9.00
Powd., f.o.b. Ga.	net ton	14.00 –	20.00
Crude f.o.b. Va.	net ton	7.00 –	9.00
Ground, f.o.b. Va.	net ton	13.00 –	19.00
Imp., lump, bulk	net ton	15.00 –	20.00
Imp., powd.	net ton	45.00 –	50.00
Feldspar, No. 1 pottery	long ton	6.00 –	7.00
No. 2 pottery	long ton	4.00 –	5.50
No. 1 soap	long ton	7.00 –	7.50
No. 1 Canadian, f.o.b. mill	long ton	20.00 –	22.00
Graphite, Ceylon, lump, first quality, bbl.	lb.	.06½ –	.....
Ceylon, chip, bbl.	lb.	.05½ –	.....
High grade amorphous crude	ton	15.00 –	35.00
Gum arabic, amber, sorts, bags	lb.	.14½ –	.15
Gum tragacanth, sorts, bags	lb.	.48 –	.56
No. 1, bags	lb.	1.50 –	1.60
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N. Y.	ton	50.00 –	55.00
Magnesite, crude, f.o.b. Cal.	ton	14.00 –	15.00
Pumice stone, imp., casks	lb.	.03 –	.05½
Dom., lump, bbl.	lb.	.05 –	.05½
Dom., ground, bbl.	lb.	.06 –	.07
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.50
Silica, sand blast, f.o.b. Ind.	ton	2.50	5.00
Silica, amorphous, 250-mesh, f.o.b. Ill.	ton	17.00 –	17.50
Silica, bldg. sand, f.o.b. Pa.	ton	2.00 –	2.75
Soapstone, coarse, f.o.b. Vt., bags	ton	7.00 –	8.00
Tale, 200 mesh, f.o.b., Vt., bags	ton	6.50 –	9.00
Tale, 200 mesh, f.o.b. Ga., bags	ton	7.00 –	9.00
Tale, 200 mesh, f.o.b. Los Angeles, bags	ton	16.00 –	20.00

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$2.75 –	.....
Corning	bbl.	1.60 –	.....
Cabell	bbl.	1.50 –	.....
Somerset	bbl.	1.40 –	.....
Illinois	bbl.	1.87 –	.....
Indiana	bbl.	1.98 –	.....
Kansas and Oklahoma, 28 deg.	bbl.	1.20 –	.....
California, 35 deg. and up	bbl.	1.04 –	.....

Gasoline, Etc.

Motor gasoline, steel bbls.	gal.	$0.21½ –	.....
Naphtha, V. M. & P. deod, steel bbls.	gal	.20½ –	.....
Kerosene, ref. tank wagon	gal.	.14 –	.....
Bulk, W. W. export	gal.	.06½ –	.....
Lubricating oils:			
Cylinder, Penn., dark	gal.	.20 –	.22
Bloomless, 30@31 grav.	gal.	.18½ –	.20½
Paraffin, pale	gal.	.24 –	.26
Spindle, 200, pale	gal.	.21 –	.22
Petrolatum, amber, bbls.	lb.	.05 –	.05½
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	ton	$45–50
Chrome brick, f.o.b. Eastern shipping points	ton	50–52
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	40–45
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	36–41
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48–50
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	48–50
F.o.b. Mt. Union, Pa.	1,000	42–44
Silicon carbide refract. brick, 9-in.	1,000	1,100.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N.Y.	ton	$200.00 –	$225.00
Ferrochromium, per lb. of Cr, 6-8% C	lb.	.11½ –	.11¾
4-6% C	lb.	.12 –	.13
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	125.00 –	.....
Spiegeleisen, 19-21% Mn.	gr. ton	40.00 –	.....
Ferromolybdenum, 50-60% Mo, per lb Mo	lb.	2.00 –	2.50
Ferrosilicon, 10-15%	gr. ton	48.00 –	50.00
50%	gr. ton	95.00 –	.....
75%	gr. ton	150.00 –	160.00

Ferrotungsten, 70-80%, per lb. of W	lb.	$0.88 - $0.90
Ferro-uranium, 35-50% of U. per lb. of U	lb.	4.50 -.....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50 - 3.75

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$6.00 - $9.00
Chrome ore Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 - 23.00
C.i.f. Atlantic seaboard	ton	20.50 - 24.00
Coke, fdry., f.o.b. ovens	ton	5.75 - 6.25
Coke, furnace, f.o.b. ovens	ton	5.50 - 6.00
Fluorspar, gravel, f.o.b. mines' Illinois	ton	20.00 - 21.50
Ilmenite, 52% TiO_2	lb.	.01½- .01¾
Manganese ore, 50% Mn c.i.f. Atlantic seaport	unit	.35 -.....
Manganese ore, chemical (MnO_2)	ton	80.00 - 85.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.65 - .70
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 - .08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½- .12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.11½- .12
Pyrites, dom. fines, f.o.b. mines, Ga	unit	.12
Rutile, 95% TiO_2	lb.	.12 -.....
Tungsten, scheelite, 60% WO_3 and over, per unit WO_3	unit	8.50 - 8.75
Tungsten, wolframite, 60% WO_3 and over, per unit WO_3	unit	8.00 - 8.25
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 - 3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	2.25 - 2.50
Vanadium pentoxide, 99%	lb.	12.00 - 14.00
Vanadium ore, per lb. V_2O_5	lb.	.75 - 1.00
Zircon, washed, iron free, f.o.b. Pablo, Fla	lb.	.02½- .10

Non-Ferrous Materials

	Cents per Lb
Copper, electrolytic	14¼-...
Aluminum, 98 to 99%	26-27½
Antimony, wholesale, Chinese and Japanese	6½- 7
Nickel, virgin metal	27-29
Nickel, ingot and shot	30-32
Monel metal, shot and blocks	32.00
Monel metal, ingots	38.00
Monel metal, sheet bars	45.00
Tin, 5-ton lots, Straits	38.62½
Lead, New York, spot	6.00
Lead, E. St. Louis, spot	5.87½
Zinc, spot, New York	6.60
Zinc, spot, E. St. Louis	6.25

Other Metals

Silver (commercial)	oz.	$0.63½
Cadmium	lb.	1.00
Bismuth (500 lb. lots)	lb.	2.55
Cobalt	lb.	3.00-3.25
Magnesium, ingots, 99%	lb.	1.25-.....
Platinum	oz.	116.00
Iridium	oz.	275.00@300.00
Palladium	oz.	80.00
Mercury	75 lb.	67.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	22 75
Copper bottoms	29.25
Copper rods	23.00
High brass wire	19.50
High brass rods	17.50
Low brass wire	21.10
Low brass rods	22.00
Brazed brass tubing	24.25
Brazed bronze tubing	29.00
Seamless copper tubing	26.50
Seamless high brass tubing	25.00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

Copper, heavy and crucible	10 25@10.50
Copper, heavy and wire	11 25@11.35
Copper, light and bottoms	10 25@10 50
Lead, heavy	5 50@ 5 75
Lead, tea	3.25@ 3 50
Brass, heavy	6 25@ 6 50
Brass, light	5.50@ 5 75
No. 1 yellow brass turnings	6.25@ 6.35
Zinc scrap	3.25@ 3.50

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3 64	$3.64
Soft steel bars	3.54	3.54
Soft steel bar shapes	3 54	3.54
Soft steel bands	4.39	4 39
Plates, ¼ to 1 in. thick	3.64	3.64

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Arkansas

BATESVILLE—The Dixie Cotton Oil Co. recently organized with a capital of $1,600,000, has tentative plans under advisement for the establishment of a cotton oil mill in this section. D. D. Adams, Batesville is one of the heads of the company.

California

SAN DIEGO—The San Diego Smelting & Refining Co., Albert A. Sampson, 140 Cuyamaca Ave., general manager, has commenced foundations for a new smelting plant on site acquired between 28th and 29th Sts. The initial unit will comprise four rotary furnaces, oil-burning type, with total capacity of 16 tons per hour; converter of 1 ton capacity, and auxiliary equipment. The plant will cost about $85,000.

SANTA MONICA—The Southern Counties Gas Co. is planning for extensions and improvements in its artificial gas plant and system in this district to cost approximately $200,000, including the installation of additional equipment.

Florida

BREWSTER—The American Cyanamid Co., manufacturer of chemicals and fertilizer products, is reported to be planning for the rebuilding of the portion of its local phosphoric acid plant, destroyed by fire, June 28, with loss approximating $400,000, including equipment. The plant is devoted to the production of phosphoric acid from pebble phosphate by an electrical process, and the reconstruction is estimated to cost the amount of fire loss. The Virginia-Carolina Chemical Co., Richmond, Va., is said to be interested in the local works.

Illinois

CHICAGO — Gumbinsky Brothers, 2261 South Union Ave., manufacturers of paper products, have plans in preparation for the construction of a new mill at 31st and California Sts. It will consist of a number of buildings, including power plant, and is estimated to cost in excess of $3,000,000 with machinery. A. Epstein, 2001 West Pershing Road, is architect and engineer. Oscar Gumbinsky is head.

ROBINSON—The Zwermann Co., manufacturer of vitreous sanitary ware, has commenced extensions and improvements in its plant to double, approximately, the present capacity. New tunnel kilns will be installed.

Indiana

TERRE HAUTE—The Smith-Alsop Paint Co. has preliminary plans under consideration for the construction of an addition to its plant to cost about $100,000, including equipment. It is expected to have detailed plans prepared in the near future.

WEST RICHMOND—The Fibre Conduit Co., Orangeburg, N. Y., manufacturer of fiber insulating products, has acquired property at West Richmond for the erection of a new branch plant. It is purposed to construct two plant units in the near future, estimated to cost about $200,000, with equipment.

Kentucky

LOUISVILLE—The Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, Pa., manufacturer of enameled iron products, etc., will commence the erection of two additions to its branch plant at 7th and Shipp Sts., Louisville, consisting of a 1-story structure 150x150 ft., and smaller building, 57x80 ft. The first noted will be equipped for casting service and the other for enameling work. The expansion will cost approximately $100,000. D. X. Murphy & Brother, Louisville, are architects.

LOUISVILLE—The Louisville Petroleum Refining Co., Inter-Southern Bldg., has plans in progress for the construction of a new oil-refining plant on local site, estimated to cost about $250,000, including machinery. W. M. Mitchell is one of the heads of the company in charge.

Louisiana

BASTROP—The Bastrop Glass Co., recently organized, will take over the local plant of the Ouachita Valley Glass Co., and will operate the property. It represents an investment of about $250,000. The new owner has tentative plans under consideration for extensions and improvements for increased production.

MONROE—The Central Carbon Co., recently organized, is perfecting plans for the construction of a new local plant for the production of carbon black. A gasoline extraction plant will also be built. The projects are estimated to cost in excess of $350,000, including equipment. C. E. Slagle is president.

MONROE—The Union Gas Products Co. has commenced the construction of a new plant for the production of carbon black, on tract of land acquired about 20 miles from the city. The works will cost close to $400,000, including equipment.

Massachusetts

MALDEN—Bernard Sandler, 21 Warren Ave., will commence the construction of a new 1-story plant for the manufacture of cement blocks and kindred products.

Michigan

CALUMET—The Calumet & Hecla Mining Co. is planning for the installation of new electric hoisting equipment and other machinery at its local copper properties. All departments of the mines are being arranged for electric operation.

DETROIT—Work will soon be commenced on three new foundries by the Cadillac Motor Car Co., a division of the General Motors Corp., to be equipped for the production of aluminum, brass, gray iron and other metal castings. The structures are estimated to cost in excess of $400,000.

Minnesota

ST. PAUL—The Creo-Dipt Co., Inc., manufacturer of creosote paints, etc., has tentative plans for the rebuilding of the portion of its plant at Vandalia St. and Territorial Road, recently destroyed by fire with loss estimated at $150,000, including equipment, stock, etc.

Missouri

FARBER—The Farber Fire Brick Co. has completed plans for the construction of a new addition to its plant for considerable increased refractory manufacture, estimated to cost about $100,000, including equipment.

Nevada

EUREKA—The Eureka Smelting Co., recently organized to take over local properties, is planning for the construction of the first unit of a new smelting plant, estimated to cost in excess of $1,000,000. The company also purposes to make extensions and improvements in its existing properties, including the installation of additional equipment. To carry out the project, the company is disposing of a bond issue of $2,500,000, a large part of the proceeds to be used for the expansion. George T. Wilson is president, and Robert B. Todd, vice-president.

New Jersey

MILLVILLE—The T. C. Wheaton Co., manufacturer of bottles and other glass containers, is planning to make improvements and repairs in its plant and furnaces as soon as the works are closed down for the annual idle period, late in July. The Millville Bottle Works is planning for similar work at its local plant.

New York

CARTHAGE—The Carthage Sulphite Pulp & Paper Co. is said to have tentative plans

under consideration for the rebuilding of the sulphite mill at its plant, destroyed by fire, June 25, with loss estimated at $200,000, including equipmnt.

Ohio

CINCINNATI—The National Ultramarine Co., Huntington, W. Va., recently organized to manufacture chemicals, colors, etc., has taken title to property at Wiehlen Road and Losantville Ave., North Cincinnati, and plans to break ground before the close of the month for the initial unit of its proposed local plant. Ralph Baugher, Huntington, is chemical engineer, in charge.

Oregon

PORTLAND—The Zimmerman Process Syndicate has plans for the construction of a new 1-story laboratory at 221 East 28th St., North, and will commence work at an early date. Carl Loregren, Portland, is architect.

Pennsylvania

SCRANTON—The L. J. Bour Refractories Co. has commenced the installation of additional equipment at its plant to provide for considerable increase in capacity.

OIL CITY—The Penn-American Refining Co. has commenced the rebuilding of the portion of its oil refining plant at Rouseville, near Oil City, recently partly destroyed by fire, and plans to place the unit in service at an early date. Charles L. Suhr is president.

PHILADELPHIA—The John T. Lewis & Brothers Co., Thompson and Cumberland Sts., manufacturer of white lead, oils, paints, etc., has work in progress on a 1-story addition, for which a general contract was recently awarded to the Turner Construction Co., 1713 Sansom St.

Tennessee

KINGSPORT—The Clinchfield Portland Cement Co., Kingsport, has acquired a tract of property about 20 miles from Macon, Ga., and has plans under way for the erection of a new manufacturing plant. The initial unit will consist of a number of buildings, to be equipped for an output of about 2,000 bbl. per day, and is estimated to cost close to $1,000,000, with machinery. A power plant will be constructed. W. M. Bennett is second vice-president and treasurer.

CHATTANOOGA—L. E. Gwinn and associates have acquired the local plant of the DeCamp Glass Casket Co. Plans are being considered for extensions and improvements for increased production. A new company will be organized, it is said, to operate the works.

Texas

PALESTINE—The Ligol Chemical Co., operating local lignite properties, has tentative plans under advisement for the construction of a byproducts plant. W. C. Balch is in charge of the project.

LULING—The United North & South Oil Co., has acquired a local site and plans for the early erection of a new refinery. It is estimated to cost in excess of $100,000, including equipment.

BROWNWOOD—The Blue Ribbon Refineries, Inc., recently organized, will take over a local oil refinery, heretofore known as the Blue Ribbon Refinery. The plant has been closed for about 12 months, and will be improved and reopened at an early date. Additional equipment will be installed in a number of operating departments. It is expected to develop a capacity for handling 2,000 bbl. of crude oil every 24 hours. The new company will operate with a capital of $250,000. J. A. Goodman is one of the company officials.

FORT WORTH—The Southwestern Portland Cement Co., Two Republics Bldg., El Paso, has commenced the construction of the first unit of its proposed cement mill on large tract of property near Fort Worth, recently purchased, and purposes to have the works ready for service at the earliest date. It is expected to develop a capacity of 3,000 bbl. per day. The plant will cost close to $1,500,000. O. J. Binsford is secretary and superintendent.

DALLAS—The United Chemical Co. has construction in progress on a new plant on the Eagle Ford Road, about 3 miles from the city, and will provide departments for the production of sulphuric acid, special battery acids, muriatic acid, sulphate of alumina, and kindred specialties. An investment of about $250,000 will be made, including the purchase of property and equipment from the Sugarland Industries, Sugarland, Tex., and removed to the new site. The company will maintain offices in the Magnolia Bldg., at Dallas. George T. Cobb is president, and E. C. Cobb secretary and treasurer.

Washington

AUBURN—Gustave Lange has completed plans and will commence the construction of a new local plant for the manufacture of terra cotta products and kindred specialties.

West Virginia

NORTHVIEW—The American Sheet Glass Co., recently organized, has taken over the plant of the Liberty Glass Co., Northview, near Clarksburg, and will establish a new works for the manufacture of window glass and other sheet glass products. Extensions and improvements will be made in the present plant, including the installation of additional equipment. H. E. Travis and P. M. Robinson head the new company.

MORGANTOWN—Jesse E. Moore, Clay, W. Va., acting for various stockholders, has acquired the local plant of the Armorcord Rubber Co., at a public sale for a consideration of $67,000. Plans are being considered for the organization of a company to reopen and improve the plant. Noah E. Moore and David C. Reay, Morgantown, are interested in the project.

Industrial Notes

EDWARD W. LAWLOR, formerly of the Alsing Co., 50 Church St., New York, has organized the Aacone Engineering Corp., 17 Steiner Place, Plainfield, N. J., for the manufacture of grinding and pulverizing apparatus and special machinery. The corporation will also handle the Needham blowers.

THE OILGEAR CO., Milwaukee, Wis., announces the appointment of the following organizations as sales representatives for Oilgear products: Federal Machinery Sales Co., 12 N. Jefferson St., Chicago, Ill.; Laughlin-Barney Machinery Co., Union Trust Bldg., Pittsburgh, Pa.; Elliott & Stephens Machinery Co., 721 Oliver Ave., St. Louis, Mo.

THE LINK-BELT CO., Chicago, has adopted the policy of holding annual "sales schools" for new men added to the sales force during the year, to be coached in company policies and standards of practice and educated as to machinery construction and design. The most recent of these schools was held at the Link-Belt Indianapolis factory, June 4, 5 and 6. The salesmen, eighteen in number, came from the Detroit, Pittsburgh, Toronto, Chicago, Boston, New York, Kansas City, St. Louis and Dallas offices.

THE GENERAL ELECTRIC CO., Schenectady, N. Y., announces that Franklin S. Terry, co-manager of the National Lamp Works, Nela Park, Cleveland, was elected vice-president of the G-E Co. and B. G. Tremain, also co-manager of the National Lamp Works, was elected a director of the G-E Co. at a meeting of the board of directors held in New York City, June 22.

THE ROLLER-SMITH CO., New York City, announces the appointment of H. D. Baker, 525 Woodward Ave., Detroit, Mich., as its representative in the state of Michigan. Mr. Baker will handle the Roller-Smith Co.'s lines of instruments, circuit breakers and radio apparatus in that territory.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

ANILINE DYES, CHEMICALS, AND DRY COLORS. Rangoon, India. Purchase and agency.—7127.

CAUSTIC SODA, calcium chloride, soda ash, acetic acid, naphthalene and rosin. Trieste, Italy. Purchase.—7066.

CAUSTIC SODA, carbon and rosin. Hamburg, Germany. Agency.—7119.

FERTILIZERS and fertilizer materials. Saloniki, Greece. Agency.—7057.

OXALIC ACID, crystalized, in 10-ton lots. Basel, Switzerland. Agency.—7094.

DYES, pharmaceutical supplies. Buenos Aires, Argentina. Agency.—7050.

New Companies

SCIENTIFIC SPECIALTIES CO., New York, N. Y.; glassware products; $30,000. Incorporators: F. Freess, R. Jorgensen and J. T. Tenny. Representative: G. A. Honnecker, 105 West 41st St., New York.

METALLURGICAL & CHEMICAL CORP., Jersey City, N. J.; chemicals and metallurgical products; $500,000. Representative: United States Corporation Co., 15 Exchange Place, Jersey City.

EASTMAN COTTON OIL CO., Jonestown, Miss.; oil products; $50,000. Incorporators: W. E. Gage and J. F. Waggoner, both of Jonestown.

ATLASTA PAINT MFG. CO., 1515 East Manchester Ave., Los Angeles, Calif.; organized; paints and varnishes. A. P. Sollender, 8598 Compton Ave., heads the company.

WESTFIELD PAPER CO., INC., Russell, Mass.; paper products; $1,000,000. Alfred H. Chapin, Springfield, Mass., is president and treasurer.

AMERICAN ANILINE PRODUCTS, INC., 1818 South Clark St., Chicago, Ill.; chemicals, colors, dyes, etc.; $100,000. Incorporators: H. A. Dodge, M. A. West and W. J. Lonergan.

HEXAGON CHEMICAL CO., Wilmington, Del.; chemicals and chemical byproducts; $600,000. Representative: Corporation Trust Co. of America, du Pont Bldg., Wilmington.

AMERICAN OIL WORKS, INC., Titusville, Pa.; refined oils; $320,000. Charles R. Westgate, Titusville, is treasurer.

LE BONRAY CORP., Newark, N. J.; chemicals and chemical byproducts; 25,000 shares of stock. Incorporators: F. P. Finck, M. C. Hely and Thomas G. Thompson, 20 Bradford Place, Newark. The last noted is representative.

REPUBLIC PAPER BOARD CO., Cincinnati, O.; paper and paperboard products; $300,000. Incorporators: C. L. Laboiteaux and Marston Allen, both of Cincinnati.

MISSOURI OIL CO., Poplar Bluff, Mo.; refined petroleum products; $225,000. Incorporators: H. E. Springer, Smackover, Ark.; P. N. Hunter and W. H. Meredith, El Dorado, Ark.

COLUMBIA CHEMICAL CO., Boston, Mass.; chemicals and chemical byproducts; $10,000. John H. Connell, 25 Putnam St., Roxbury, Mass., president and treasurer.

M. F. LEFEBVRE GLASS CO., South Vineland, N. J.; glass products; $50,000. Incorporators: Leon Schaffer, Ernest J. and Marcel F. Lefebvre, South Vineland. The last noted is representative.

WALKER PINE PRODUCTS CORP., New York, N. Y.; turpentine, rosin, etc.; $3,000,000. Incorporators: William L. Knebel and Oliver P. Bartlett, New York; and William J. Ryan, Newark, N. J. Representative: Corporation Trust Co. of America, du Pont Bldg., Wilmington, Del.

MOUNT UNION TANNING & EXTRACT CO., Mount Union, Pa.; tanning extracts, etc.; $75,000. Raymond Greene, Mount Union, is treasurer.

ROTH RUBBER CO., 1520 Monadnock Block, Chicago, Ill.; rubber products; 1,000 shares of stock, no par value. Incorporators: Otto R. Barnett, Harvey M. Gillespie and Percival H. Truman.

MCPHAIL OIL CORP., Fort Worth, Tex.; petroleum products; $1,000,000. Incorporators: Van McPhail, Herbert Hedick and M. W. West, all of Fort Worth.

ALLEN & VAN DYKE SUPPLY CO., Brooklyn, N. Y.; chemicals and chemical byproducts; $5,000. Incorporators: R. Kramer and R. Rummel. Representative: H. L. Schaefer, 25 Liberty St., New York.

LIBBY GLUE & PRODUCTS CO., Boston, Mass.; glue, adhesive products, etc.; $250,000. Thomas E. Libby is president; and Nelson B. Gladwin, Weymouth, Mass., treasurer.

FEDERAL LEATHER CO., Jersey City, N. J.; leather products; $250,000. Representative: Corporation Trust Co., 15 Exchange Place, Jersey City.

CENTURY OIL & REFINING CO., South Bend, Tex.; refined petroleum products; $150,000. Incorporators: L. Z. Grace, R. G. Pearson and T. B. Wenningham, all of South Bend.

OTRA CHEMICAL CO., New York, N. Y.; chemicals and chemical byproducts; $100,000. Incorporators: O. C. Carpenter, F. W. Bode and E. F. Carney. Representative: Holmes, Rogers & F. Carpenter, 20 Broad St., New York.

LUROX LTD., Portland, Me.; soaps; $10,000. M. F. Foster is president; and M. G. O'Neil, treasurer, both of Portland. Representative: A. B. Farnham, Portland.